Summary Report

Derive Entities Emissions Testing

April 12, 2016

Submitted to:

U.S. ENVIRONMENTAL PROTECTION AGENCY
William Jefferson Clinton Building, 1200 Pennsylvania Ave., NW,
Washington, DC 20004

Submitted by:

Eastern Research Group, Inc.
14555 Avion Parkway, Suite 200
Chantilly, VA 20151

EPA Contract No. EP-W-12-007
EPA WA-2-1

(page intentionally left blank)

EXECUTIVE SUMMARY

In October and November 2015, a compliance inspection team consisting of staff from EPA and EPA's contractor, Eastern Research Group, Inc. (ERG) conducted emissions tests using electronic control module (ECM) tuners manufactured by Derive Entities on diesel and gasoline engines. Derive Entities is the parent company of several subsidiaries including Bully Dog Acquisition, LLC (Bully Dog) and SCT Performance, LLC (SCT). This report summarizes dynamometer emissions testing performed by EPA and ERG using Bully Dog's Diesel GT tuner (PN: 40420) and SCT's X4 Powerflash tuner (PN: 7015) on a model year (MY) 2012 Ford F-250 test vehicle with a 6.7 liter Ford Powerstroke diesel engine and a MY 2013 Ford F-150 with a 3.5 Liter Eco boost gasoline engine, respectively. The test results confirm that the Bully Dog 40420 tuner, when installed on a MY 2012 F-250 with a 6.7 liter Powerstroke diesel engine, causes nitrous oxide (NO_x) emissions to nearly triple on the Federal Test Procedure (FTP) and exceed the applicable emissions standard for this engine. The test results also confirm that the SCT 7015 tuner alters the 3.5 Liter Ford EcoBoost engine's operational design but does not increase regulated exhaust emissions on this vehicle application over the test cycles used. Further, the manufacturer of these tuners has not provided EPA any emissions test results demonstrating that this tuner does not adversely affect emissions.

(page intentionally left blank)

TABLE OF CONTENTS

Page

(This page intentionally left blank.)

A compliance inspection team consisting of staff from EPA and EPA's contractor, ERG, investigated SCT and Bully Dog for manufacturing and selling potential defeat devices for on-highway engines. The inspection team purchased SCT and Bully Dog ECM tuning devices, installed modified calibrations on test vehicles using the tuners, and performed emissions testing. The EPA and ERG traveled to EPA's National Vehicle and Fuel Emissions Laboratory (NVFEL) the weeks of 26 October and 2 November 2015 to conduct emission testing on a model year (MY) 2012 Ford F-250 test vehicle with a 6.7 Liter Ford Powerstroke diesel engine and a MY 2013 Ford F-150 with a 3.5 Liter EcoBoost gasoline engine. The purpose of this testing was to identify which engine controls are altered by the SCT and Bully Dog tuners and how use of these tuners affect emissions of regulated pollutants.

Report Recipients:	Andrew Zellinger, EPA Region 9 Margaret Alkon, EPA Region 9 Kathryn Caballero, MSEB, EPA Headquarters
EPA Representatives:	Greg Orehowsky, MSEB, EPA Headquarters John Spieth, EPA, OTAQ, EPA NVFEL Arleen Smithson, OTAQ, EPA NVFEL
EPA Contractors:	Brent Ruminski, ERG Aasim Rawoot, ERG Michael Sabisch, ERG Andrew Loll, ERG
Ford Representatives:	[redacted]

This report is organized as follows:

- Section I provides the background on Derive as a business, EPA's investigation of Derive, and the purpose of this testing.
- Section II describes the purchases of the Bully Dog and SCT tuners that were tested.
- Section III provides descriptions of the test vehicles, tuner installation, testing procedures, and quality assurance and other documentation.
- Section IV provides the testing results including on-board diagnostics (OBD) data, live engine data, and emissions data.
- Appendix A contains photographs taken during the investigation. Photographs are referenced in the report as Photograph [#].
- Appendix B is a table containing a chronological order of emissions testing activities performed by ERG, EPA, and Ford.
- Appendix C contains miscellaneous email documentation.
- Appendix D contains the raw emissions test data from EPA's NVFEL.
- Appendix E contains dynamometer coefficient documentation from EPA's NVFEL.
- Appendix F and G contain ERG's analysis of live engine data logged during testing.
- Appendix H contains screenshots of internet forums related to Bully Dog tuner customers who have complained about DPF regeneration.

I. INVESTIGATION BACKGROUND AND PURPOSE OF TESTING

As the business is currently structured, Derive is the parent company to several subsidiaries including, but not limited to, SCT Performance LLC (SCT) and Bully Dog Acquisitions LLC (Bully Dog). ERG

collectively refers to the business as "Derive" where appropriate in this report. Below is a general list of products that Derive manufactures and sells.

- Electronic Control Modules (ECM) Tuners
- Custom Tuning Software (SCT Advantage III)
- Custom Fleet Tunes

The purpose of the testing described in this report was to evaluate how the ECM tuners that Derive manufactures and sells may affect emissions. Specifically, EPA's goal was to evaluate if the modified calibrations installed by the tuners cause the vehicle to exceed exhaust emission standards for which the test vehicles were certified to meet. Secondly, EPA's goal for this testing was to evaluate the relative change in emissions from the test vehicle when using modified calibrations installed via a tuner compared to the stock calibration (i.e., baseline).

These tuners are devices that plug into a vehicle's on-board diagnostic (OBD) data link connector (DLC) (i.e., port) and then can be used to "flash" the ECM with a modified calibration (i.e., tune). All Derive tuners come with pre-loaded calibrations manufactured by Derive but can also support "custom" tunes manufactured by other companies. Each tuner comes with multiple pre-loaded tunes that are compatible with different vehicle and engine models and MYs.

During this testing, the EPA and ERG focused on testing pre-loaded tunes (i.e., no custom tunes) with two specific tuner models: the Bully Dog GT Platinum Diesel tuner (PN: 40420) and the SCT X4 Powerflash tuner (PN: 7015). ERG refers to these tuners as the Bully Dog 40420 tuner and SCT 7015 tuner for the remainder of this report. Testing was performed on two specific test vehicles: a MY 2012 Ford F250 with a 6.7 liter Powerstroke diesel engine and a MY 2013 Ford F150 with a 3.5 liter EcoBoost gasoline engine. The modifications the tuners make depend on the vehicle and engine model and MY on which they are installed. Therefore, the effect these tuners may cause on emissions are likely to be different for other vehicle and engines models and MYs.

In general, there are two types of calibrations:

- *Emissions equipment-present calibrations*: These calibrations modify engine parameters such as fuel injection/spark timing, air to fuel ratio, torque management, and other parameters to optimize power and fuel economy. Such modifications may adversely affect emissions but do not require the emission control devices (e.g., EGR, DPF, SCR) to be rendered inoperative or to be bypassed. EPA's goal is to determine what engine parameters these types of calibrations alter and if these alterations adversely affect emissions.
- *Emissions equipment-removed calibrations:* These calibrations render inoperative or bypass emission control devices (e.g., EGR, DPF, SCR) in the engine calibration in addition to modifying engine parameters such as fuel injection/spark timing, air to fuel ratio, torque management, and other parameters to optimize power and fuel economy. EPA's goal is to determine if the tuner renders inoperative or bypasses emission control devices and if these alterations adversely affect emissions.

The testing summarized in this report identified no evidence that the Bully Dog 40420 and SCT 7015 tuners contain pre-loaded[1] emissions equipment-*removed* calibrations for the test vehicle models[2] tested. However, the testing of the pre-loaded emissions equipment-*present* calibration installed by the Bully Dog 40420 tuner confirm that emissions are adversely affected (see Section IV for results). It is also important to note that these tuners are compatible with many different vehicles, engines, and MYs and the

[1] Pre-loaded calibrations are those that are manufactured by SCT or Bully Dog.
[2] Ford was only able to provide the two test vehicle models described in Section III.A and was unable to provide other test vehicle models for which SCT tuners are capable of disabling emission controls.

modifications made by the tuners vary for each. In fact, during other investigation activities, the EPA and ERG have determined that several of Derive's products, including the SCT 7015 tuner, can disable emission control devices on *other* vehicle and engine models. Furthermore, many of Derive's products, including the tuners discussed in this report, support installation of custom tunes that are known to disable emission control devices. This report does not discuss these areas of concern; they are described in a separate memorandum titled *TD69 – Derive Product Purchase Memorandum*.[3] All the areas of concern identified during the investigation of Derive are summarized in a separate memorandum titled *TD66 – Derive Investigation Summary and CAA 208 Information Request Response Review*.[4]

II. PURCHASE OF ECM TUNERS

ERG purchased the Bully Dog 40420 tuner and SCT 7015 tuners as a typical customer would from aftermarket dealers. The following two subsections summarize ERG's purchase of the tuners, both of which were used to perform emissions testing the weeks of 26 October 2015 and 11 November 2015. A detailed timeline of tuner purchase and testing events are provided in Appendix B. Once received, ERG handled all items as evidence, completed chain-of-custody forms for each upon receipt, and properly maintained the documentation and evidence throughout the investigation. The purchases of both tuners are documented in more detail in ERG's memorandum titled *TD69 – Derive Product Purchase Memorandum.*[5]

A. Bully Dog 40420 Tuner

ERG purchased a Bully Dog 40420 tuner directly from Punch-It Performance, LLC, a company the EPA and ERG inspected on 4 August 2015. ERG was unable to take possession of the tuner that day because Punch-It did not have one in stock. Instead, the unit was shipped directly from Bully Dog Acquisitions located at 2839 Highway 39 in American Falls, Idaho 83211 to ERG's office. The total cost of the tuner was $649. ERG received the unit on 11 August 2015. Photographs [1] through [5] show the Bully Dog 40420 tuner as received by ERG. The serial number of the tuner is 30V6S0F7L000T and the Punch-It Performance UPC code is 681018404204. Photograph [5] shows the contents of the tuner packaging:

- Tuner (PN: 40420);
- Small SD card;
- USB dongle;
- Quick reference guide;
- OBD II wire, used to connect the tuner to the OBD data link connector; and
- USB wire, used to connect the tuner to a computer for software updates from Bully Dog.

B. SCT 7015 Tuner

ERG purchased an SCT 7015 tuner directly from Punch-It Performance, LLC, a company the EPA and ERG inspected on 4 August 2015, and took possession of the tuner the same day. The total cost of the tuner was $399. Photographs [6] through [8] show the SCT 7015 tuner as received by ERG. The serial

[3] Under Contract #EP-W-12-007 Work Assignment WA-2-1 Technical Direction 69, the EPA directed ERG to purchase multiple SCT and Bully Dog products and evaluate their tuning capabilities.
[4] Under Contract #EP-W-12-007 Work Assignment WA-2-1 Technical Direction 66, the EPA directed ERG support EPA's investigation of Derive including, but not limited to, reviewing Derive's CAA 208 Information Request response.
[5] Under Contract #EP-W-12-007 Work Assignment WA-2-1 Technical Direction 69, the EPA directed ERG to purchase multiple SCT and Bully Dog products and evaluate their capabilities.

number of the unit is X40717156ECA5 and the SCT UPC code is 811252020001. Photograph [6] shows the contents of the packaging:

- OBD II wire, used to connect the tuner to the OBD data link connector on the vehicle;
- USB wire, used to connect the tuner to a computer for software updates from SCT; and
- SCT warranty document.

III. EMISSIONS TESTING PROCEDURES AND DOCUMENTATION

Ford Motor Company (Ford) agreed to provide EPA with two test vehicles for EPA to conduct testing to measure emissions and engine operating data when calibrations from the Bully Dog 40420 and SCT 7015 tuners are installed. The EPA and ERG traveled to EPA's NVFEL testing facility in Ann Arbor, Michigan the weeks of 26 October 2015 and 2 November 2015 to conduct the testing. EPA's NVFEL personnel performed testing and ERG provided testing oversight and installed the calibrations. The following two subsections describe the test vehicles that Ford provided for testing, along with the complete testing procedures.

A. Test Vehicles

Table 1 provides a detailed description of the test vehicles Ford provided which included a MY 2012 F-250 with a 6.7 Liter Powerstroke turbo diesel engine and a MY 2012 F-250 with a 3.5 Liter Ford EcoBoost twin turbo direct injection gasoline engine. Photographs [9] through [15] show the MY 2012 F-250 diesel test vehicle prior to any testing. Photographs [16] through [22] show the MY 2013 F-150 gasoline test vehicle prior to any testing.

Table 1. Test Vehicle Description

Parameter	MY 2012 Diesel Vehicle	MY 2013 Gasoline Vehicle
Chassis manufacturer	Ford Motor Company	Ford Motor Company
Chassis model	F-250	F-150
Chassis date of manufacture	July 2011	May 2012
Engine manufacturer	Ford Motor Company	Ford Motor Company
Engine MY	2012	2013
EPA engine family	CFMXD06.761A	DFMXT03.54DX[b]
Engine configuration	V-8	V-6
Engine size	6.7 liters	3.5 liters
Fuel	diesel	gasoline
GVWR	10,000 pounds	7,700 pounds
VIN	1FT7W2BT7CEA03971	1FTFW1ET6DFA00007
Odometer beginning of testing	52,765 miles	46,992 miles
Aftertreatment mileage[c]	52,765 miles	46,992 miles
Useful Life	120,000 miles	120,000 miles
Emissions equipment	OC, period trap oxidizer (PTOX)[a], SCR, EGR, turbo charger (TC), Charge air cooler (CAC), direct diesel injection (DDI), OBD	2 three way catalysts (TWC), 2 heated air-fuel ration sensors (AFS), 2 heated oxygen sensors (HO2S), direct fuel injection (DFI), 2 TC, CAC, OBD

a – This system contains the DPF.

b – ERG was unable to identify the engine label on the F-150. Ford reported it to EPA MSEB after testing (see Appendix C).
c – Ford confirmed the aftertreatment mileage matches the odometer reading on both test vehicles (see Appendix C).

Table 2 and Table 3 show the additive deterioration factors (DF), engine adjustment factors (EAF), certification levels, and emissions standards for the two test vehicles based on certification testing. The relevant pollutants for the test vehicles include nitrogen oxides (NO_x), particulate matter (PM), carbon monoxide (CO), Carbon dioxide (CO_2)[6], and non-methane hydrocarbon (NMHC).

- DF is a factor that represents the increase in emissions over the life of a vehicle as a result of engine and emission control device performance deterioration. Specifically, this is the increase between certification testing, when the aftertreatment system has only been used for approximately 4,000 miles, and the end of the useful life of the aftertreatment system. Engine manufacturers must add the DF to the measured emissions when determining the official certification level.
- Upward EAF is an additional factor added to the measured emissions to determine certification levels when regeneration does not occur during the testing. This factor accounts for excess emissions during DPF regeneration and only applies to diesel engines equipped with DPFs.[7]
- Certification level is the measured emissions after DFs and EAFs are applied to the measured emissions for certifications. The certification level must be less than the certified standard.
- Certified standard is the applicable standard under 40 CFR Part 86 that the certification level must meet.

Table 2. Certification Emission Levels and Standards for Engine Family CFMXD06.761A (6.7 Liter Ford Powerstroke)

Useful Life (miles)	Test	Constituent	Emission Result (g/mi)[a]	Additive DF (g/mi)[b]	Upward EAF (g/mi)[c]	Certification Level (g/mi)[d]	Standard (g/mi)[e]
120,000	FTP	CO	0.35000	0.2100	0.01000	0.6	7.3
		HC-NM	0.03280	0.0192	0.00110	0.053	0.195
		HCHO	0.00420	0	0.00010	0.004	0.032
		NOX	0.12000	0.0500	0.01000	0.2	0.2
		PM	0.00500	0.0050	-0.00010	0.01	0.02

Source: All data are available on EPA's website at: http://www.epa.gov/otaq/crttst.htm.
a – This is the measured emissions test result from the emissions test.
b – This factor represents the increase in emissions over the life of a vehicle as a result of engine and emission control device performance deterioration. Specifically, this is the increase between certification testing, when the aftertreatment system and engine have only been used for approximately 4,000 miles, and the end of the useful life.
c – This factor is added to the measured emissions test result when determining certification levels when DPF regeneration does not occur during the testing. This factor accounts for excess emissions during DPF regeneration and only applies to diesel engines equipped with DPFs.
d – This is the emissions levels for this engine family certified by Ford at the end of the useful life after applying appropriate DF and EAFs to the raw emission test results at 4,000 miles.

[6] CO_2 was also measured but is not a regulated pollutant for the F-250 and, therefore, excluded from Table 2.
[7] When regeneration does not occur during the testing, manufacturers must add upward EAFs to account for the excess emissions during regeneration. Downward EAFs are also certified for each engine family which are added when regeneration does occur. Table 2 only shows upward EAFs because ERG did not consider a test in which a regeneration occurs to be valid due to the inability to replicate two tests in which a regeneration occurs. More information on engine adjustment factors is available online at: http://www.epa.gov/otaq/highway-diesel/workshop/420f04022.pdf.

e – Emissions standards this engine family is required to meet at the end of the useful life after applying appropriate DF and EAFs to the raw emission test results at 4,000 miles.

Table 3. Certification Emission Levels and Standards for Engine Family DFMXT03.54DX (3.5 Liter Ford EcoBoost)

Useful Life(miles)	Test	Pollutant	Emission Result (g/mi)[a]	Additive DF (g/mi)[b]	Certification Level (g/mi)[c]	Standard (g/mi)[d]
4,000	US06	CO	0.66000	0	0.7000	11.8
		HC-NM+NOX	0.04300	0	0.0400	0.60
	SC03	CO	0.43000	0	0.4000	4.0
		HC-NM+NOX	0.04800	0	0.0500	0.44
50,000	HWFE	NOX	0.00300	0.004000	0.0100	0.07
	FTP	CO	0.68000	0.250000	0.9000	3.4
		NMOG	0.02620	0.010000	0.0360	0.075
		NOX	0.00800	0.004000	0.0100	0.05
120,000	HWFE	CREE	385.00000	1.100000	386.0000	999.99
		NOX	0.00280	0.011000	0.0140	0.090
		OPT-CREE	388.00000	1.700000	390.0000	999.99
	US06	CO	0.66000	0.630000	1.3000	19.3
	SC03	CO	0.43000	0.630000	1.1000	6.4
	FTP	CO	0.68000	0.630000	1.3000	4.2
		CREE	524.00000	1.100000	525.0000	999.99
		NMOG	0.02620	0.025100	0.0510	0.090
		NOX	0.00800	0.011000	0.0200	0.07
		OPT-CREE	527.00000	1.700000	529.0000	999.99

Source: All data are available on EPA's website at: http://www.epa.gov/otaq/crttst.htm.
a – This is the measured emissions test result from the emissions test.
b – This factor represents the increase in emissions over the life of a vehicle as a result of engine and emission control device performance deterioration. Specifically, this is the increase between certification testing, when the aftertreatment system and engine have only been used for approximately 4,000 miles, and the end of the useful life.
c – This is the certified emissions levels for this engine family at the end of the useful life after adding appropriate DF and EAFs to the raw emission test results at 4,000 miles.
d – Emissions standards this engine family is required to meet at the end of the useful life after applying appropriate DF and EAFs to the raw emission test results at 4,000 miles.

B. Testing Procedures

The following subsections describe the test procedures EPA and ERG followed during emissions testing:

- Section III.B.1 describes tuner calibration installation;
- Section III.B.2 describes obtaining OBD data before and after each test;
- Section III.B.3 describes obtaining live engine data during each test; and
- Section III.B.4 describes test cycle selection and test procedures.

EPA completed one baseline and one tuner test for each test vehicle, as summarized in Table 4. As shown, the Bully Dog 40420 tuner was tested on two separate occasions, referred to as "Bully Dog – Void" and "Bully Dog – Valid" in the test calibration column. This is because after the first Bully Dog test on 28 October 2015, ERG analyzed the live engine data and determined that an active DPF

regeneration occurred[8]; therefore, EPA and ERG refer to all of the tests performed on 28 October 2015 as void and do not compare the results to baseline. Section IV.B, where results from ERG's analysis of live data is summarized, provides additional details about the regeneration that occurred. As a result, EPA performed a second test with the Bully Dog 40420 tuner installed on 10 November 2015, in which a regeneration did not occur, referred to as the "Bully Dog – Valid" calibration. ERG was not present for this test on 10 November 2015.

To prevent a DPF regeneration from occurring a second time, ERG, with the assistance of NVFEL, forced a manual DPF regeneration on the F-250 test vehicle on 3 November 2015. The F-250 test vehicle did not have a manual DPF regeneration command button in the cab but the Bully Dog 40420 tuner provided the capability to do the manual DPF regeneration. Photographs [23] through [27] shows the DPF regeneration menu option on the Bully Dog 40420 tuner before, during, and after the regeneration. There were two types of regenerations that could be forced using the tuner: stationary or mobile. The EPA NVFEL mounted the F-250 test vehicle to the dynamometer and ERG forced a stationary regeneration.

Table 4. Chassis Dynamometer Test Matrix for Testing

Vehicle – Engine	Test Calibration	Test Dates	
		Prep Date[a]	Test Date[b]
F-250 – 6.7 Powerstroke	Stock (i.e., baseline)	10/27/2015	10/28/2015
F-250 – 6.7 Powerstroke	Bully Dog – Void[c]	10/28/2015	10/29/2015
F-250 – 6.7 Powerstroke	Bully Dog - Valid	11/9/2015	11/10/2015
F-150 – 3.5 Liter EcoBoost	Stock (i.e., baseline)	11/2/2015	11/3/2015
F-150 – 3.5 Liter EcoBoost	SCT 7015	11/5/2015	11/6/2015

a – The prep date is the date EPA ran the test vehicle on the prep cycle described in Section III.B, which must occur between 12 and 36 hours before the start of the FTP test.
b – The test date is the date EPA ran the four tests described in Section III.B.4 which includes the FTP, HWFE, US06, and SC03 tests.
c – ERG determined that an active DPF regeneration occurred during this test. As a result, EPA and ERG refer to this test as void and do not compare the results to baseline.

The following describes the general procedure the EPA and ERG followed for each tuner calibration and test. Table 16 in Appendix B provides a more detailed order of test procedures.

1. ERG downloaded the calibration identifications (Cal ID), calibration verification numbers (CVNs), the status of the malfunction indicator light (MIL) and diagnostic trouble codes (DTC) from the ECM with the existing calibration installed. See Section III.B.2 for more information on what these parameters are and how ERG obtained them.
2. ERG used the tuner to install the calibration to be tested. See Section III.B.1 for the detailed procedures ERG followed for each tuner and calibration installation. ERG started the engine momentarily to allow the ECM to detect DTCs and to recalculate the CVN.
3. ERG obtained the new Cal ID, CVN, MIL status, and DTCs from the ECM with the calibration installed.
4. ERG connected the data logger to the vehicle to obtain live engine data parameters over time during testing. See Section III.B.3 for detailed procedures related to the data logger.
5. EPA performed the test procedures described in Section III.B.4.b. See Section III.B.4.a for more details on the underlying test cycles included in these test procedures.

[8] A DPF regeneration s a process in which the soot (i.e., PM) collected by the DPF is burned off at high temperature to leave only a tiny ash residue. Active regeneration is one method that is used when there is not sufficient heat in the exhaust to convert all the carbon being collected. During active regeneration, exhaust temperatures are raised by injecting a small amount of fuel upstream of the DPF.

1. Tuner Installation

As described above, the SCT and Bully Dog tuners all come with preloaded tunes manufactured by SCT and Bully Dog, respectively. The following subsections provide specifics regarding installation options ERG selected for testing.

a. Bully Dog 40420 Tuner Installation

After the Bully Dog 40420 tuner is turned on, a menu appears with the following options: change vehicle, install download, gauge setup, diagnostics, performance testing, driving coach setup, special functions, user options, show settings, vehicle info, uninstall download (see Appendix A Photographs [28] and [29]). To install a new calibration, ERG selected the "install download" menu option shown in Photograph [30]. Table 6 shows the Bully Dog 40420 tuner installation prompts in sequential order and indicates what ERG selected for testing. Photographs [34] through [39] show screenshots for each prompt during tuner installation. Photographs [40] and [41] show the device settings on the tuner after the tune installation completed, which shows the tuner as "installed".

During Step #1 in Table 6, ERG first attempted to select "'11-'12 6.7L Powerstroke" but received the "Error 222 – Part Number Not Supported. Update Unit and Try Again. Contact Tech Support if problem continues" prompt shown in Photograph [31]. ERG immediately hooked the tuner to a laptop computer and ran the update software that can be downloaded from Bully Dog's website. Photograph [32] and [33] show screenshots of the software update on ERG's laptop computer. ERG reattempted the installation process but received the same error message shown in Photograph [31]. EPA MSEB immediately contacted Ford by telephone, who stated that the stock engine calibration on the test vehicle was an updated version released in 2015 for MY 2012 vehicles. ERG then attempted to install the "'13-'15 Ford 6.7 Powerstroke" application and was successful.

Table 5. Installation Prompts for the Bully Dog 40420 Tuner on 2012 MY F-250 with a 6.7 Liter Powerstroke Diesel Engine

Step #	Prompt	Input Options	Option Selected for Testing	Photograph #
1	Vehicle Selection	• '03-'07 6.0L Powerstroke • '08-'10 6.4L Powerstroke • '11-'12 6.7L Powerstroke • '13-'15 6.7L Powerstroke[a]	'13-'15 6.7 Powerstroke[b]	34
2	Selected Vehicle – please verify vehicle type. Installing on: '13-'15 Ford 6.7 Powerstroke. If this is correct press 'Yes'	• Yes • No	Yes	35
3	Install download	• Pre-load tune	Pre-load tune	36
4	Do you want to remove the speed limiter or leave the stock limiter?	• Removed • Stock	Stock	37
5	Is your truck a cab and chassis?	• Yes • No	No	38

a – Other input options were shown in these prompt for Dodge and General Motors (GM) vehicle applications.
b – Note that Photograph [40] shows the tuner "installed" on a "'13-'15 Ford 6.7 Powerstroke" application but the F-250 test vehicle is a 2012 MY. See explanation in introductory text above Table 5.

Photograph [41], which is a continuation of the device settings that were installed, shows that all defuel options were turned off prior to testing. The Bully Dog 40420 tuner includes defueling options that presumably reduce the tuner settings if certain conditions are met. These conditions are set by the user

when turning on defueling options (e.g., if engine coolant temperature increases above a designated value). ERG ensured that all defuel options were off for testing as shown in Photograph [41].

Photograph [42] shows the main screen on the tuner after the installation process was completed. As shown in the bottom right, the "extreme" on-the-fly tune was selected. The other three on-the-fly settings were "stock", "tow", and "performance". To confirm that the most recent on-the-fly setting remained when the tuner was unplugged and then plugged back in, ERG called Bully Dog technical support on 28 October 2015. ERG also confirmed this by unplugging the tuner from the vehicle with the "extreme" setting selected and then plugging the tuner back in and observing the "extreme" tune was still selected.

b. SCT 7015 Tuner Calibration Installation

After the SCT 7015 tuner is turned on, a menu appears with the following options: program vehicle, gauges/data log, vehicle functions, vehicle info, device info, device settings (see Photograph [43]). ERG first documented the device info, shown in Photographs [44] and [45], followed by the vehicle info menu, shown in Photograph [46]. To install a new calibration, ERG selected the "program vehicle" menu option shown in Photograph [43]. When ERG attempted to install an SCT calibration onto the test vehicle on 3 November 2015, the SCT 7015 tuner recognized the 3.5 Liter EcoBoost engine as shown in Photograph [48]). However, the next screen stated "General error# 110AE, additional update required. Please run auto-update" (see Photograph [49]). ERG immediately hooked the SCT 7015 tuner to a laptop computer and ran the auto-update software that was downloaded from SCT's website. Photographs [50] and [51] show screenshots of the software update on ERG's laptop computer. After this update, the SCT no longer reported this error and ERG was able to continue with the installation process.

Table 6 shows the SCT 7015 installation prompts in sequential order and indicates what ERG selected for testing. Photographs [52] through [64] show screenshots for each prompt during the Ford testing installation.[9] Photograph [65] shows the device settings on the SCT 7015 tuner after the tune installation completed, which shows the tuner as "married" and with a "preloaded tune -59 - KGCTAA6".

Table 6. Installation Prompts for the SCT 7015 Tuner on MY 2013 F-150 with a 3.5 Liter EcoBoost Gasoline Engine

Step #	Prompt	Input Options	Option Selected for Testing	Photograph #
1	Fuel Octane	• 87 Octane • 87 Octane tow • 91 Octane • 91 Octane tow • 93 Octane • 93 Octane tow	93 Octane	52
2	Intake air box	• Stock air box • Airaid	Stock air box	53
6	Global spark	• 0 degrees to -14 degrees	0 degrees	54
3	Axle Ratio	(no Photograph take)	Stock Value	52
4	Tires Revs/Mile	(no Photograph take)	Stock Value	52
5	Speed limit	(no Photograph taken)	Stock Value (100 mph)	52

[9] However, as shown in Photograph [63], one more error message appeared during the install which was determined to be low battery voltage. A battery charger was connected to the vehicle for several minutes to remove this error.

Table 6. Installation Prompts for the SCT 7015 Tuner on MY 2013 F-150 with a 3.5 Liter EcoBoost Gasoline Engine

Step #	Prompt	Input Options	Option Selected for Testing	Photograph #
6	Rev limit neutral	(no Photograph taken)	Stock value (4200 PM)	52
8	Idle speed drive	• 580 to 1180 rpm	Stock Value (580 rpm)	58
8	Idle speed neutral	• 625 to 1225 rpm	Stock Value (625 rpm)	58
9	Wide open throttle (WOT) shift points	• -7 to +7 mph	+ 7 mph	55
10	Adjust tire pressure monitor system cold PSI setting?	• No • 0 through 45 psi	No	57

2. OBD Scan Tool Data Procedure

After each installation of each new calibration using the tuner during emissions testing at Ford, ERG immediately removed the tuner, connected an OBD II scan tool[10] to the OBD II data link connector (DLC) on the test vehicle, and obtained DTCs, status of the MIL, Cal ID, and CVN. ERG obtained this information during the testing process:

- Before installing a new calibration using the tuner;
- After installing a new calibration using the tuner and before the emissions test;
- After completing each emission test; and
- After returning the ECM calibration to stock after each test.

The following describes each one of the parameters ERG recorded during testing using the scan tool. Section IV.A summarizes the observations.

- Cal ID – The Cal ID represents the software version, which includes the engine data maps. A new calibration installation may or may not result in a new Cal ID, depending on the tuner.
- CVN – The CVN is the result of a 'check-sum' calculation performed by the OBD system using the engine data maps as inputs. If the data values have not been changed or corrupted, the CVN will always provide the same sum for a given Cal ID. If the ECM has been corrupted or any calibration values have been modified, the CVN calculation will generate an incorrect 'sum'.[11] ERG used this as the ultimate indicator that the tuner installed a new calibration between each test.
- DTCs – DTCs are diagnostic trouble codes that indicate a fault has been detected in one of the engine or emission control systems and indicates the system that had the fault.
- MIL – The malfunction indicator light, also known as the check engine light, is a symbol located near the odometer. The MIL indicator is amber (yellow) in color and should be illuminated for the first five seconds after the ignition key is turned on to show that the MIL light is working

[10] ERG used two different OBD II scan tools during testing: an AutoXray ® 4000 and a Nexiq Pocket IQ.
[11] SAE J1979 states: *Calibrations developed by any entity other than the vehicle manufacturer will generally have a calibration verification number that is different from that calculated based on the calibration developed by the vehicle manufacturer.*

properly. After startup, the light is only illuminated when a malfunction is detected following the detection of confirmed DTCs. The MIL activates when monitored operating parameters indicate an engine or emission control component failure has occurred that has the potential to cause the vehicle's emissions to exceed the certification standard by a certain threshold.

3. Live Engine Data Logging Procedure and Analysis

During testing, the EPA and ERG logged live engine operational data. After testing, ERG used the data to evaluate operating parameters that may affect emissions such as fuel injection timing, EGR flow, fueling rates, air-to-fuel ratio (AFR), manifold pressure, DPF loading, and SCR system status. The exact parameters analyzed varied by vehicle and are listed in Appendices F and G. Specific details about the data loggers used and logging procedures are described in the following two subsections.

To analyze the data, ERG calculated percentiles values (i.e., 1st, 10th, 20th, 30th, 40th, 50th, 60th, 70th, 80th, 90th, and 99th percentiles) for each parameter over identical tests using Microsoft Excel. Section IV.B provides the results of ERG's analysis. For all calculations, ERG excluded all data points logged before the vehicle speed increased from zero at the beginning of the test and all data points after the engine RPM changed to zero at the end of the test as the engine was turned off. By eliminating the data before the vehicle moved and after the vehicle stopped, ERG was able to compare data sets on an equivalent basis (e.g., same length of time and speed trace).

a. F-250 – 6.7 Liter Ford Powerstroke

For all F-250 testing, the EPA and ERG used a HEM Data Dawn Mini Logger™ data logger configured to acquire enhanced (manufacturer-specific) engine data. ERG logged the live data by connecting the logger to the OBD II DLC just prior to baseline testing and after ERG installed the new calibration and removed the tuner from the vehicle (prior to "tuner installed" testing). The list of parameters recorded for the F-250 are contained in Appendix F, along with ERG's analysis of the data. Some of the logged parameters were manufacturer-specific. Results of live data analysis are summarized in Section IV.B. The data logger activates when the vehicle engine speed (i.e., RPM) increases from zero after the engine is turned on. The data logger was set to record data at a rate of 10 hertz or 10 data points per second. The EPA NVFEL converted the data into comma separated value format and provided ERG all of the recorded data after testing.

b. F-150 – 3.5 Liter Ford EcoBoost

For all F-150 testing, the EPA and ERG used an Auterra Dyno-Scan (version 10.0.1) data logger. ERG logged the live data by connecting the logger to the OBD II DLC and then connected a laptop computer to the data logger. During operation, the data was logged directly onto the laptop computer. Some of the logged parameters were manufacturer-specific. The list of parameters recorded for the F-150 are contained in Appendix G, along with ERG's analysis of the data. Results of live data analysis are summarized in Section IV.B. Unlike the HEM Data logger, the Auterra logger did not allow the frequency rate for data recording to be manually set. The data logger logged at an approximate rate of 1 hertz or 1 data point per second.

4. Test Cycle Selection and Test Procedure

EPA's goal was to evaluate if the modified calibrations installed by the tuners cause the vehicle to exceed exhaust emission standards for which the test vehicles were certified to meet. Secondly, EPA's goal for this testing was to evaluate the relative change in emissions from the test vehicle when using modified calibration using a tuner compared to the stock calibration (i.e., baseline). The following subsections describe the test cycles performed for the purpose of meeting these goals and the specific procedures performed at the EPA NVFEL. Results from emissions tests are described in Section IV.

a. Test Cycle Descriptions

Table 7 describes the preparation (prep), FTP-75, HWFE, US06, SC03 test cycles in terms of distance, time, and number of phases within a single test cycle. All information provided in this section, including the figures provided below Table 7, are publicly available on EPA's website.[12]

- Prep– As required by 40 CFR Part 86, EPA NVFEL ran a prep cycle the day before each FTP-75 test. The prep cycle is the Urban Dynamometer Driving Schedule (FTP-72). It is designed to mirror city driving conditions simulating frequent starts and stops. It is described in 40 CFR Part 86 Appendix I (a) and contains two phases (505 second, 3.6 mile Phase 1 and an 867 second, 3.9 mile Phase 2). Figure 1 shows the speed trace of a single prep cycle.
- FTP-75: The FTP-75 is another variation of the EPA Urban Dynamometer Driving Schedule (FTP-72) and is the primary test cycle used for certification. It is derived from the Urban Dynamometer Driving Schedule (FTP-72) by adding a third 505 second phase to the test cycle following a 10 minute engine-off soak. The third phase is identical to the first phase of FTP-72. The FTP-75 is also described in 40 CFR Part 86 Appendix I (a). Prior to a the FTP-75 test, the vehicle must go through a 12 to 36 hour "cold soak" period[13] after the prep cycle during which the engine cannot be started. Figure 2 shows the speed trace of a single FTP-75 test cycle.
- HWFE: The HWFE is used by EPA to determine highway fuel economy for light duty vehicles. It consists of a single phase of non-stop highway driving. Figure 3 shows the speed trace of a single HWFE test cycle which is available in 40 CFR Part 600 Appendix I.
- US06: The US06 test cycle, also known as the Supplemental Federal Test Procedure (SFTP), addresses the shortcomings of FTP-72. It captures aggressive, high speed and/or high acceleration driving behavior, rapid speed fluctuations, and driving behavior following startup. Figure 4 shows the speed trace of a single US06 test cycle which is available in 40 CFR Part 86 Appendix I (g).
- SC03: The SC03 is another variation of the SFTP but requires the use of the air conditioning (A/C) system during the test and at a lab temperature of 95°F (35°C). For this testing, EPA was unable to incorporate the lab temperature of 95°F. Figure 5 shows the speed trace of a single SC03 test cycle which is available in 40 CFR Part 86 Appendix I (h).

Table 7. Test Cycle Descriptions

Test Cycle	Description	Test Cycle Breakdown		
		Phase #	Distance (miles)	Time (seconds)
Prep	Normal city driving	Phase 1	3.6	505
		Phase 2	3.9	867
		Total test cycle	7.5	1,372
FTP-75	Normal city driving	Phase 1	3.6	505
		Phase 2	3.9	867
		Phase 3	3.6	505
		Total test cycle	11.1	1,877
HWFE	Highway driving	Only 1 phase	10.26	765
US06	Hard city and highway driving	Only 1 phase	8.0	600
SC03	Hard city	Phase 1	3.6	596

[12] Available online at: http://www.epa.gov/nvfel/testing/dynamometer.htm.
[13] The room temperature during the cold soak period must be between 68 and 86 degrees Fahrenheit (40 CFR 86.130).

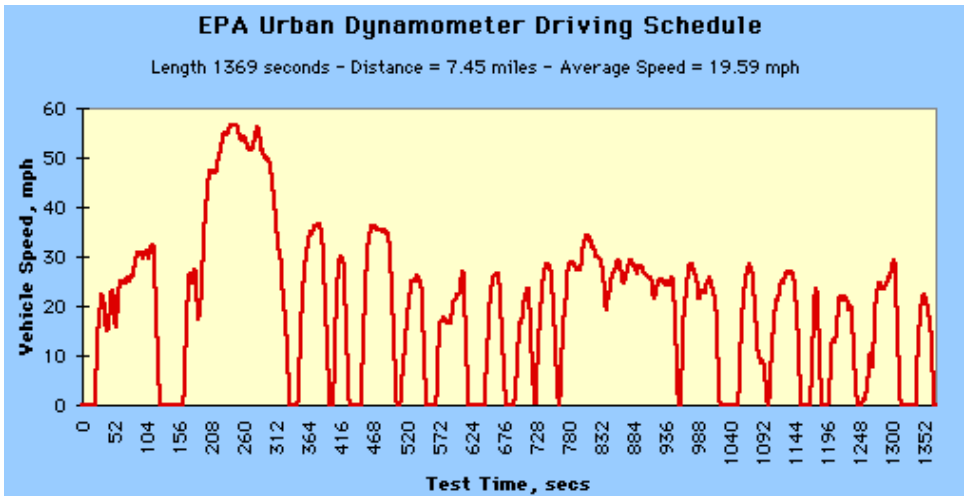


Figure 1. One Prep Cycle Speed Trace (i.e., FTP-72)

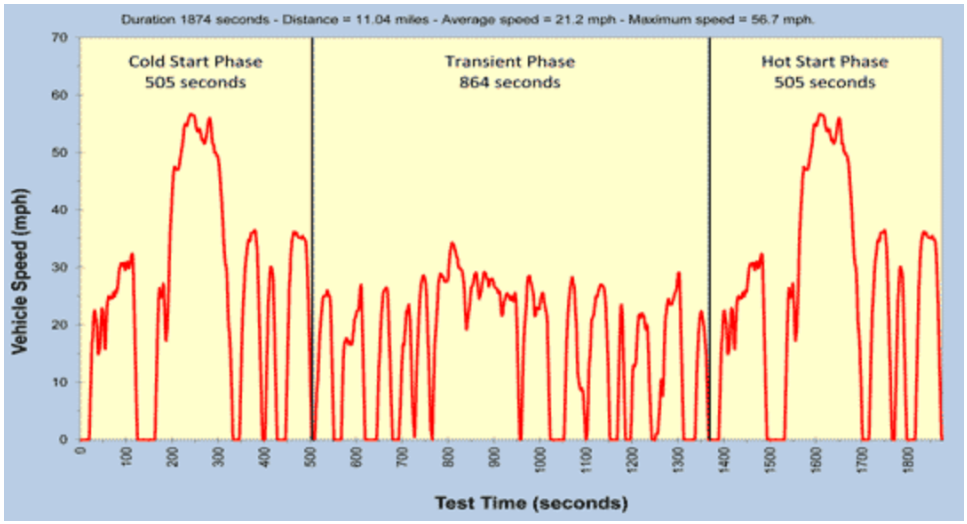


Figure 2. One FTP-75 Test Cycle Speed Trace

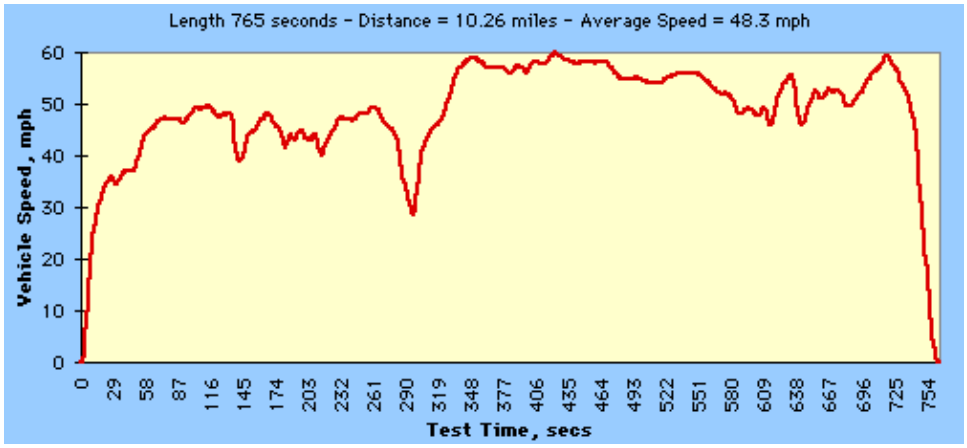


Figure 3. HWFE Test Cycle Speed Trace

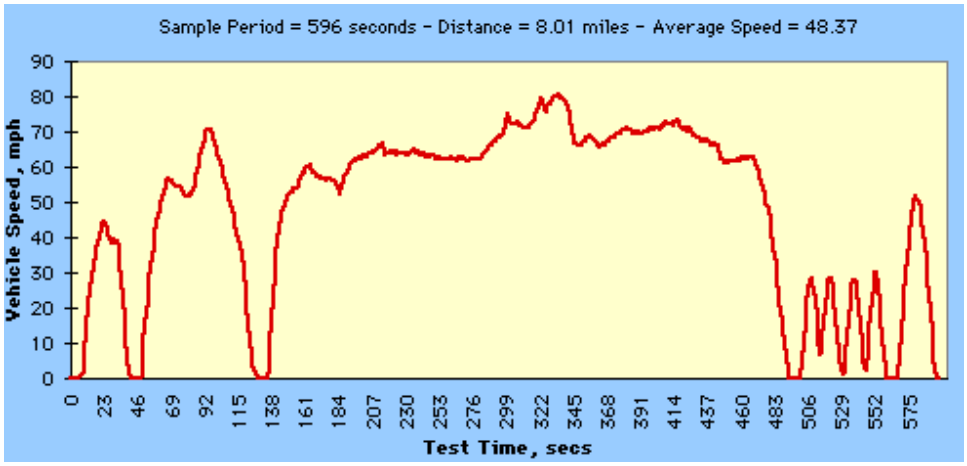


Figure 4. US06 Test Cycle Speed Trace

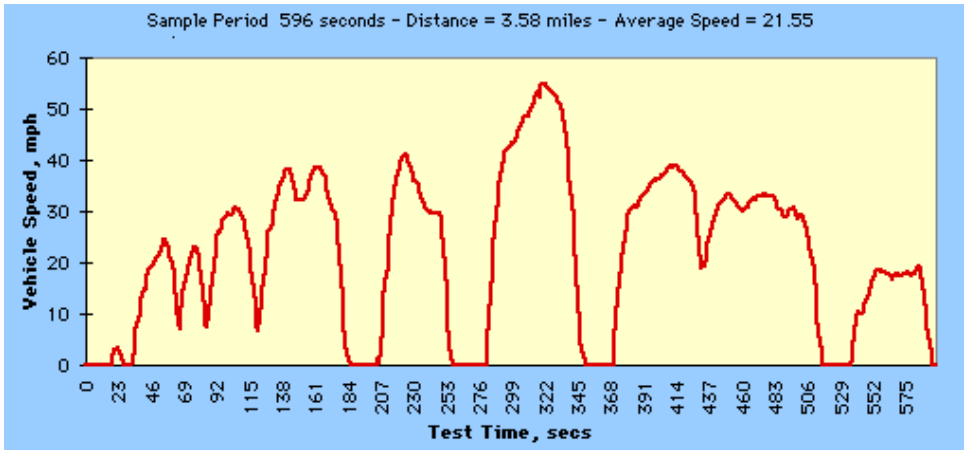


Figure 5. SC03 Test Cycle Speed Trace

b. Test Procedures at NVFEL

The procedures for each FTP, HWFE, US06, SC03 test are listed below. Asterisks indicate results ERG used for evaluating how each calibration affected engine operation in Section IV.B and emissions in Section IV.C. EPA used the same dynamometer calibration settings for each test which are provided in Section III.C. For each calibration tested on the FTP, EPA completed the following procedure. Asterisks (*) mark specific test runs that result in emissions test results for the purpose of evaluating the tuners.

1. Performed one prep (FTP-72) test cycle (engine could be cold, warm, or hot).
2. Allowed a 12 to 36 hour soak period.
3. Performed the FTP75 test cycle:
    a. Performed Phase 1 of the FTP test cycle (cold start).*
    b. Performed Phase 2 of the FTP test cycle (stabilization phase).*
    c. Allowed a 10 minute engine off period.
    d. Performed Phase 3 of the FTP test cycle (hot start).*

ERG used the weighted bag results[14] for all three phases of the FTP75 test cycle as the valid result for comparing results in Section IV.C. This ensures that the vehicle's engine and emission control devices were at the same operating temperature at the beginning of each second and valid test cycle.

HWFE Tests

For each calibration tested on the HWFE, EPA completed the following procedure:

1. Performed one HWFE test cycle.
2. Performed a second consecutive HWFE test cycle immediately after Step 1. This inherently included a short engine-on idle period following Step 1, as specified in the HWFE speed trace at the end and beginning of each HWFE test cycle.*

ERG only used the result from this second consecutive HWFE cycle (Step 2 above) for evaluating how each calibration affected emissions in Section IV. This ensures that the vehicle's engine and emission control devices were at the same operating temperature at the beginning of each second and valid test cycle.

US06 Tests

For each calibration tested on the US06, EPA completed the following procedure:

1. Performed one US06 test cycle.
2. Performed a second consecutive US06 test cycle immediately after Step 1. This inherently included a short engine-on idle period following Step 1, as specified in the US06 speed trace at the end and beginning of each US06 test cycle.*

ERG only used the result from this second consecutive US06 cycle (Step 2 above) for evaluating how each calibration affected emissions in Section IV. This ensures that the vehicle's engine and emission control devices were at the same operating temperature at the beginning of each second and valid test cycle.

SC03 Tests

For each calibration tested on the SC03, EPA completed the following procedure:

1. Performed one SC03 test cycle.
2. Allowed a 10 minute engine off period.
3. Performed a second consecutive SC03 test cycle.*

ERG only used the result from this second consecutive SC03 cycle (Step 2 above) for evaluating how each calibration affected emissions in Section IV. This ensures that the vehicle's engine and emission control devices were at the same operating temperature at the beginning of each second and valid test cycle.

C. Quality Assurance and Other Documentation

The EPA NVFEL followed the quality assurance and dynamometers testing procedures outlined in a quality assurance project plan (QAPP) titled *OECA Test Program at NVFEL: Aftermarket Tuning Effect on Emissions - QAPP (October 2015)*. The QAPP incorporates by reference the procedures set forth in

[14] The weighted bag results are calculated by the EPA NVFEL and reported on the official report.

the EPA NVFEL's *QSP-514 Vehicle Testing Practices, Version 7, (04/28/2015).* The EPA NVFEL is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005.[15]

ERG performed additional quality control checks after receiving all results from the EPA NVFEL. These checks are summarized in Table 8 and Table 9 for the F-250 and F-150, respectively. Each test can be identified in the raw emissions results files contained in Appendix D using the test identifier assigned by the EPA NVFEL. ERG verified that the same inertia weight and set coefficients were used for each test.

Table 8. 2012 MY F-250 Test Documentation

Test and Vehicle Calibration		EPA NVFEL Test ID[a]	Test Date	Beginning Odometer (mi.)	Dynamometer Calibration Settings[b]				Soak Period (hr.)[c]
					Inertia (lbs.)	EPA Set Co A	EPA Set Co B	EPA Set Co C	
FTP	Baseline	2016-0026-006	10/28/2015	52,832	9,500	-16.94	-0.5339	0.0496	20.8
HWFE	Baseline	2016-0026-003	10/28/2015	52,843	9,500	-16.94	-0.5339	0.0496	N/A
US06	Baseline	2016-0026-004	10/28/2015	52,863	9,500	-16.94	-0.5339	0.0496	N/A
SC03	Baseline	2016-0026-005	10/28/2015	52,879	9,500	-16.94	-0.5339	0.0496	N/A
FTP	BD-VOID	2016-0026-008	10/29/2015	52,895	9,500	-16.94	-0.5339	0.0496	14
HWFE	BD-VOID	2016-0026-009	10/29/2015	52,906	9,500	-16.94	-0.5339	0.0496	N/A
US06	BD-VOID	2016-0026-010	10/29/2015	52,926	9,500	-16.94	-0.5339	0.0496	N/A
SC03	BD-VOID	2016-0026-011	10/29/2015	52,940	9,500	-16.94	-0.5339	0.0496	N/A
FTP	BD-Valid	2016-0026-016	11/10/2015	52,973	9,500	-16.94	-0.5339	0.0496	17.9
HWFE	BD-Valid	2016-0026-018	11/10/2015	52,984	9,500	-16.94	-0.5339	0.0496	N/A
US06	BD-Valid	2016-0026-019	11/10/2015	53,004	9,500	-16.94	-0.5339	0.0496	N/A
SC03	BD-Valid	2016-0026-020	11/10/2015	53,019	9,500	-16.94	-0.5339	0.0496	N/A

a – This is the test identifier associated with the raw emissions reports assigned by the EPA NVFEL.
b – These is dynamometer calibration settings from the raw emissions reports in Appendix D.
c – This is the length of the cold soak period. It starts when the engine was turned off at the end of the prep cycle and ends when the engine is started for the FTP test.

Table 9. 2013 MY F-150 Test Documentation

Test and Vehicle Calibration		EPA NVFEL Test ID[a]	Test Date	Beginning Odometer (mi.)	Dynamometer Calibration Settings[b]				Soak Period (hr.)[c]
					Inertia (lbs.)	EPA Set Co A	EPA Set Co B	EPA Set Co C	
FTP	Baseline	2016-0030-002	11/3/2015	47,036	6,000	-12.59	-0.0583	0.03829	16.5
HWFE	Baseline	2016-0030-003	11/3/2015	47,047	6,000	-12.59	-0.0583	0.03829	N/A
US06	Baseline	2016-0030-004	11/3/2015	47,068	6,000	-12.59	-0.0583	0.03829	N/A
SC03	Baseline	2016-0030-005	11/3/2015	47,084	6,000	-12.59	-0.0583	0.03829	N/A
FTP	SCT 7015	2016-0030-006	11/6/2015	47,107	6,000	-12.59	-0.0583	0.03829	16.0
HWFE	SCT 7015	2016-0030-007	11/6/2015	47,119	6,000	-12.59	-0.0583	0.03829	N/A
US06	SCT 7015	2016-0030-008	11/6/2015	47,140	6,000	-12.59	-0.0583	0.03829	N/A
SC03	SCT 7015	2016-0030-009	11/6/2015	47,156	6,000	-12.59	-0.0583	0.03829	N/A
FTP	Baseline	2016-0030-002	11/3/2015	47,036	6,000	-12.59	-0.0583	0.03829	16.5
HWFE	Baseline	2016-0030-003	11/3/2015	47,047	6,000	-12.59	-0.0583	0.03829	N/A

[15] The EPA's NVFEL accreditation was valid from 7 April 2015 through 30 April 2016. See http://www3.epa.gov/nvfel/documents/cert-epa-nvfel-isoiec-17025-scope-2015-04.pdf

Table 9. 2013 MY F-150 Test Documentation

Test and Vehicle Calibration		EPA NVFEL Test ID[a]	Test Date	Beginning Odometer (mi.)	Dynamometer Calibration Settings[b]				Soak Period (hr.)[c]
					Inertia (lbs.)	EPA Set Co A	EPA Set Co B	EPA Set Co C	
US06	Baseline	2016-0030-004	11/3/2015	47,068	6,000	-12.59	-0.0583	0.03829	N/A

a – This is the test identifier associated with the raw emissions reports assigned by EPA NVFEL.
b – This is dynamometer calibration information from the raw emissions reports in Appendix D.
c – This is the length of the cold soak period. It starts when the engine was turned off at the end of the prep cycle and ends when the engine is started for the FTP test.

As part of EPA's NVFEL standard operating procedure, derivation tests are run with each vehicle on the dynamometer in order to determine the correct set coefficients. This process calibrates the dynamometer to request the proper road load from the vehicle being tested. In order to run the derivation tests, values known as "manufacturer target coefficients" must be used as inputs which were reported to the EPA NVFEL by Ford prior to testing and are shown in Table 10 below along with the resulting set coefficients (also shown in Table 8 and Table 9 above).

Table 10. Manufacture Target Coefficients and EPA Set Coefficients

Parameter		Test Vehicle	
		F-250	F-150
Manufacturer Target Coefficients Reported by Ford to the EPA NVFEL	Target A	64.98	63.52
	Target B	1.5436	0.5449
	Target C	0.03721	0.03725
Manufacturer Target Coefficients Used by the EPA NVFEL	Target A	64.98	63.52
	Target B	1.3544[a]	0.5449
	Target C	0.03721	0.03725
EPA Set Coefficients determined by the EPA NVFEL via Derivation Runs	Set Coefficient A	-16.94	-12.59
	Set Coefficient B	-0.5339	-0.0583
	Set Coefficient C	0.0496	0.03829

a – This coefficient was incorrectly entered by the EPA NVFEL before the derivation run for the F-250. The EPA NVFEL determined that this error resulted in 2.30 to 4.24 percent less road load demanded by the dynamometer from the F-250, depending on the speed, compared to if the correct coefficient was used.

It is important to note that for the F-250 test, the manufacture target coefficient was incorrectly entered for the derivation run on 26 October 2015 as 1.3544; the correct value was 1.5436. As a result, the set coefficient B determined by the EPA NVFEL for the F-250 was also incorrect. However, for the purpose of this testing, EPA used the same EPA set coefficients for all remaining tests because the error was not identified until after the first valid Bully Dog test was completed for the F-250. Further, the EPA NVFEL determined this error resulted in 2.30 to 4.24 percent less road load demanded by the dynamometer from the F-250, depending on the speed, compared to if the correct coefficient had been used. Because less road load does not adversely affect (increase) emissions, the EPA MSEB and ERG decided the selected coefficients used were sufficiently suitable for the purpose of this testing. Appendix E provides the documentation the EPA MSEB and ERG received from the EPA NVFEL regarding the difference in road load.

IV. EMISSIONS TESTING RESULTS

The following subsections summarize the results and observations from the emissions testing at the EPA NVFEL including OBD data observations, analysis of live engine data, and measured emissions.

- Section IV.A summarizes observations of general diagnostic information reported through the OBD before and after tuner installation.
- Section IV.B summarizes ERG's analysis of live engine data obtained during the testing.
- Section IV.C summarizes the measured emissions results.

A. OBD Scan Tool Data Observations

As described in Section III.B.2, before and after installation of each tuner calibration, ERG immediately removed the tuner, connected an OBD II scan tool to the OBD II DLC on the test vehicle, and obtained OBD data. ERG observed DTCs, the status of the MIL, Cal ID [16], and CVN. [17] It is important to note that when a tuner is unplugged, the most recent calibration remains installed on the ECM, along with any software modifications.

1. F-250 – 6.7 Liter Ford Powerstroke

Table 11 shows OBD data observed on the F-250 test vehicle at various stages of testing. Ford verbally confirmed the week of 26 October 2015 that the F-250 test vehicle contained the most recent production calibration[18]. The observed CVN 1 changed from the stock CVN 1 value after installing the Bully Dog 40420 tuner calibration confirming that the tuner modified the stock calibration in some way. The tuner also altered the Cal ID 1 name when installing the modified calibration. CVN 2, CVN 3, and CVN 4[19] never changed during the course of testing. After installing the Bully Dog 40420 tuner calibration and starting the engine, the OBD II scan tool always reported the MIL as "off" and no DTCs were present.

As shown in Table 11, the observed Cal ID 1 and CVN 1 did not match the stock value as received from Ford after returning the F-250 calibration to stock following the first and void Bully Dog test on 28 October 2015. However, when the Bully Dog 40420 tuner was reinstalled on 2 November 2015 before the valid Bully Dog test, the observed Cal ID 1 and CVN 1 values matched the observed values from the initial installation of the Bully Dog tune on 28 October 2015. This confirms that the same Bully Dog calibration was installed for both the void and valid Bully Dog test.

[16] The Cal ID represents the software version, which includes the engine data maps.
[17] The CVN is the result of a 'check-sum' calculation performed by the OBD system using the engine data maps as inputs. If the data values have not been changed or corrupted, the CVN will always provide the same sum for a given Cal ID. If the ECM has been modified or corrupted, the CVN calculation will generate an incorrect 'sum'.
[18] A "production" calibration is one that can be found on vehicles sold to consumers at Ford dealerships. This excludes calibrations that OEMs may use during research and development.
[19] There are multiple Cal ID because there are multiple control modules for this engine.

Table 11. OBD Scan Tool Observations During Emissions Testing on MY 2012 F-250 with a 6.7 Liter Powerstroke Diesel Engine

Parameter	Stock[a] 10/28/2015	BD Tune (void test)[b] 10/28/2015	Returned to Stock[c] 10/29/2015	BD Tune (valid test)[d] 11/2/2015 and 11/6/2015
TCM Cal ID	Not Reported	Not Reported	Not Reported	Not Reported
TCM CVN	1426FABE	1426FABE	1426FABE	1426FABE
Cal ID 1	DDCM2A6.H32	DDBN3C3.H32	DDCL0CA.H32	DDBN3C3.H32
Cal ID 2	BC3A-14D609-BA	BC3A-14D609-BA	BC3A-14D609-BA	BC3A-14D609-BA
Cal ID 3	Not Reported[e]	Not Reported[e]	DC3A-14F553-AA	DC3A-14F553-AA
Cal ID 4	Not Reported[e]	Not Reported[e]	DC3A-14G265-AC	DC3A-14G265-AC
CVN 1	20AADB09	9F71DCDC	6A188191	9F71DCDC
CVN 2	0885FD1F	0885FD1F	0885FD1F	0885FD1F
CVN 3	000009AE	000009AE	000009AE	000009AE
CVN 4	0000CD85	0000CD85	0000CD85	0000CD85
MIL Status	Off	Off	Off	Off
Inactive DTCs	0	0	0	0
Active DTCs	0	0	0	0

a – OBD data observed prior to any testing.
b – OBD data observed after installing Bully Dog calibration prior to void test in which DPF regeneration occurred.
c – OBD data observed after returning ECM to stock after the void test in which DPF regeneration occurred.
d – OBD data observed after reinstalling Bully Dog calibration prior to the final and valid test in which DPF regeneration did not occur. This matched the original calibration based on observed Cal IDs and CVNs. ERG checked these values on 2 November 2015 and also on 6 November 2015. The EPA NVFEL performed the valid test on 10 November 2015.
e – The OBD scan tool used prior to 28 October 2015 was an AutoXray ® 4000, which did not report Cal ID 3 and 4 but did report CVN 3 and 4. Starting on 29 October 2015, ERG used a Nexiq Pocket IQ scan tool and was able to observe Cal ID 3 and 4.

1. F-150 – 3.5 Liter Ford EcoBoost

Table 12 shows OBD data observed on the F-150 test vehicle at various stages of testing. Ford verbally confirmed the week of 2 November 2015 that the F-150 test vehicle contained the most recent production calibration. The observed CVN changed from the stock CVN after installing the SCT 7015 tuner calibration, confirming that the tuner modified the stock calibration maps in some way. The tuner did not alter the Cal ID name when installing a modified calibration. After installing the SCT 7015 tuner calibration and starting the engine, the OBD II scan tool reported the MIL as "off" and no DTCs were present. Additionally, the observed Cal ID and CVN matched the original values after returning the ECM to stock, verifying that the SCT 7015 tuner successfully returns the ECM to its stock calibration with no trace of modification using a generic OBD scan tool.

Table 12. OBD Scan Tool Observations During Emissions Testing on MY 2013 F-150 with a 3.5 Liter EcoBoost Gasoline Engine

Parameter	Stock[a] 11/2/2015	SCT 7015 Tune[b] 11/3/2015	Returned to Stock 11/6/2015
Cal ID	KGCTAA6.H32	KGCTAA6.H32	KGCTAA6.H32
CVN	7BDE06C5	E579F642	7BDE06C5
MIL Status	Off	Off	Off
Inactive DTCs	0	0	0
Active DTCs	0	0	0

a – OBD data observed prior to any testing.
b – OBD data observed after installing the Performance SCT 7015 calibration.
c – OBD data observed after returning ECM to stock after the SCT 715 test.

B. Live Engine Data

During the testing, the EPA and ERG logged live engine operating data by connecting a data logger directly to the OBD II data link connector. ERG logged data during both baseline tests and tuner tests performed on the dynamometer and also on-road tests to identify possible changes in engine and emission control system operation. After testing, ERG analyzed the live data, focusing on parameters that might affect emissions performance if altered from the designed operating range. The data logger models used and general analysis methods are provided in Section III.B.3. The Microsoft Excel analysis files are provided in Appendix F and G and include ERG's analysis and raw data. The following two subsections summarize the results for the F-250 test vehicle with the Bully Dog 40420 tuner installed and the F-150 test vehicle with the SCT 7015 tuner installed.

1. F-250 – 6.7 Liter Ford Powerstroke

ERG observed several changes to engine and emission control device operation on the F-250 test vehicle with the Bully Dog 40420 tuner installed compared to the baseline tests with the stock calibration installed. The parameters for which ERG identified changes are listed below and are discussed in the following subsections. Relevant figures and data tables are provided in these subsections, and Appendix F contains ERG's entire data analysis for the F-250 tests including more detailed descriptions of the data parameters.

- Inferred DPF loading
- Commanded EGR
- SCR ammonia level
- Manifold absolute pressure
- Engine load
- Fuel injection timing

ERG also examined all other logged parameters for which no significant changes were identified with the Bully Dog 40420 tuner installed, including variable geometry turbo charger, fueling injection quantity, engine reference torque, and SCR adaptation factor. A complete list of parameters acquired is provided in Appendix F.

The live data was also used to monitor the status of DPF regeneration. Specifically, ERG reviewed the "Diesel Particulate Filter Regeneration Status" parameter[20] for each test to ensure that a DPF regeneration did not occur. This parameter is set to a value of zero if no regeneration is occurring or a value of one if a regeneration is occurring. As explained in Section III.B, ERG determined that a DPF regeneration did occur during the first Bully Dog 40420 tuner test on 29 October 2015[21]. As a result, all live data and emission tests results from that test were considered void by the EPA MSEB and ERG. The EPA NVFEL performed a second Bully Dog 40420 tuner test on the F-250 test vehicle on 10 November 2015 during which ERG confirmed no DPF regeneration occurred.

a. Inferred DPF Loading

The inferred DPF loading[22] parameter is the soot loading on the DPF represented as a percentage of the maximum possible soot loading (0 = clean, 100 = dirty). The EPA MSEB and ERG were unable to obtain information from SAE documents or Ford representatives about how the ECM calculates this parameter and uses it to monitor or control the DPF. However, EPA did identify useful information from certification documents for the MY 2012 6.7 liter Powerstroke engine family (CFMXD06.761A) which state that [redacted] DPF regenerations are high emission events and the frequency at which they occur must be accounted for during the engine certification process (see Section III.A).

As shown in Table 13, over the course of all tests (FTP, HWFE, US06, and SC03), the cumulative change (i.e., delta) of inferred DPF loading increased at a higher rate with the Bully Dog 40420 tuner installed compared to the stock calibration.[23] Observations varied by test. On the FTP test, it increased nearly twice as much with the tuner installed (see Figure 6). For both the HWFE and US06 tests, the inferred DPF loading slightly increased with the Bully Dog 40420 tuner installed from the beginning of the test to the end. On the other hand, the inferred DPF loading decreased (i.e., soot was burned off) with the stock calibration over these two tests (see Figure 7). For the US06 and HWFE tests, it's plausible for the DPF loading to decrease (i.e., burn off soot), not increase (i.e., accumulate soot), as a result of higher engine load and temperatures over those tests, which might passively burn off soot. This is demonstrated by the baseline tests but not the Bully Dog tests.

DPF loading increases were greater on the baseline SC03 test than the Bully Dog SC03 test. However, the fuel economy increased by 11 percent during the Bully Dog SC03 test and the absolute load recorded with the data logger was reduced, indicating the A/C was turned off during the Bully Dog SC03 test. ERG was not present during this test on 10 November 2015 to confirm this condition (i.e., A/C turned off) but was present for the baseline test on 28 October 2015 when it was turned on per the SC03 test procedure.

ERG conducted internet searches related to the Bully Dog 40420 tuner and identified several customers who have complained about DPF regeneration frequency when using the Bully Dog 40420 tuner. Appendix H provides screenshots of all examples identified. Below are examples contained in Appendix H.

> *I have been using a bullydog triple dog set to extreme. The EGR and DPF clogged up pretty good and the mechanic i took it to said that could be the cause…The extreme setting runs more fuel thru the system the the emissions system has time to clean up[sic].*

[20] Ford parameter ID FPID-F48B
[21] Active DPF regeneration began in phase 3 (of 3) of the FTP test and finished during the HWFE warm up test cycle. However, the effects on emissions and engine operation before and after regeneration occurred are unknown.
[22] Ford enhanced parameter FPID-042C
[23] It is possible that the modifications made to other parameters by the Bully Dog 40420 tuner affected the accuracy of the DPF loading calculation.

This dealer said it was "plugged exhaust filter due to aftermarket tuner.

Dont use the tuner with the DPF still intact. This is why your DPF keeps getting plugged up…Best thing you can do is DOC, DPF delete, EGR turned off/unplugged/EGR blocker plate [sic].

Bully Dog has no tune for the LML yet. Waste of time useing a tuner without doing full deletes anyway. Your mileage will drop if anything useing a tuner with DPF intact due to the more frequent regen needed from added fuel of the tuner[sic]..

Before the tuner I was about 1 regen per tank. Now I am experiencing a regen about every 100-125 miles (about 4-5 times per tank)… I do like the power gain. Just not to impressed with the constant regeneration cycles. I just hope it doesn't have any long term effects on the truck. The way i'm thinking about it is like this: At 100,000 miles with the tuner, the truck will have regenerated as many times as it would at 400,0000 miles without the tuner (before I was regenerating 1 time per tank on average)[sic].

Table 13. Inferred DPF Loading (Percent) for F-250 Testing with the Bully Dog 40420 Tuner

Test	Baseline Test (i.e., Stock)			Bully Dog Test (Extreme setting)		
	Test Start Value[a]	Test End Value[a]	Delta[b]	Test Start Value[a]	Test End Value[a]	Delta[b]
FTP	83.3	87.2	4.0	15.3	23.3	8.0
HWFE	85.5	83.3	-2.3	22.7	23.3	0.6
US06	76.5	71.4	-5.1	28.4	29.5	1.1
SC03	78.2	83.3	5.1	32.2	32.9	0.6
Total[c]	83.3	83.3	0	15.3	32.9	17.6

Blue – Fuel economy increased by 11 percent and reduced absolute load recorded with the data logger indicates the A/C was turned off during the Bully Dog SC03 test. ERG was not present during this test on 10 November 2015 to confirm but was present for the baseline test on 28 October 2015 when it was turned on per the SC03 test procedure.
a – The inferred DPF loading at the end of each individual test does not match the DPF loading at the beginning of the subsequent test because, as explained in Section III.B.4, each test included two consecutive test cycles but only the second test cycle is used to generate official test results.
b – A positive delta indicates the soot loading on the DPF increased over the test. A negative value indicates the soot loading on the DPF decreased over the test.
c – This is the total change in inferred DPF loading from the start of the FTP test to the end of the SC03 test.

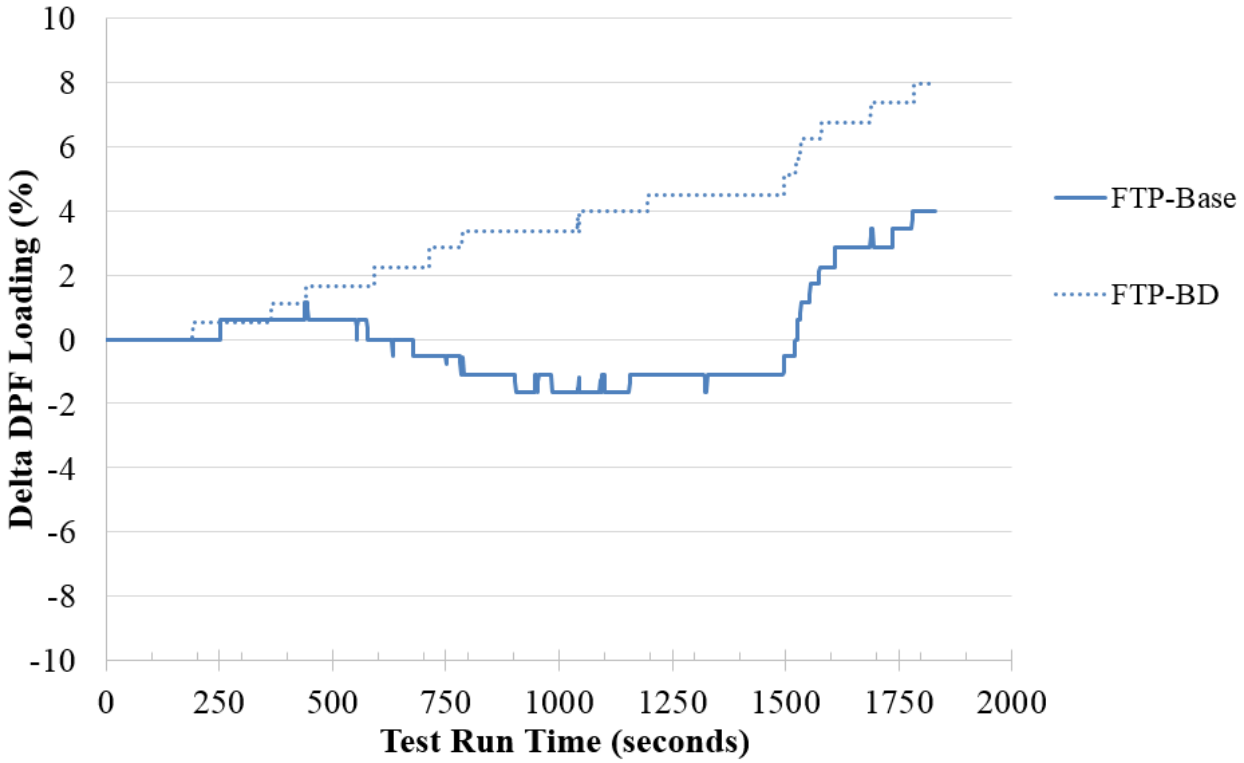


Figure 6. Inferred Delta DPF Loading (%) on the FTP Test

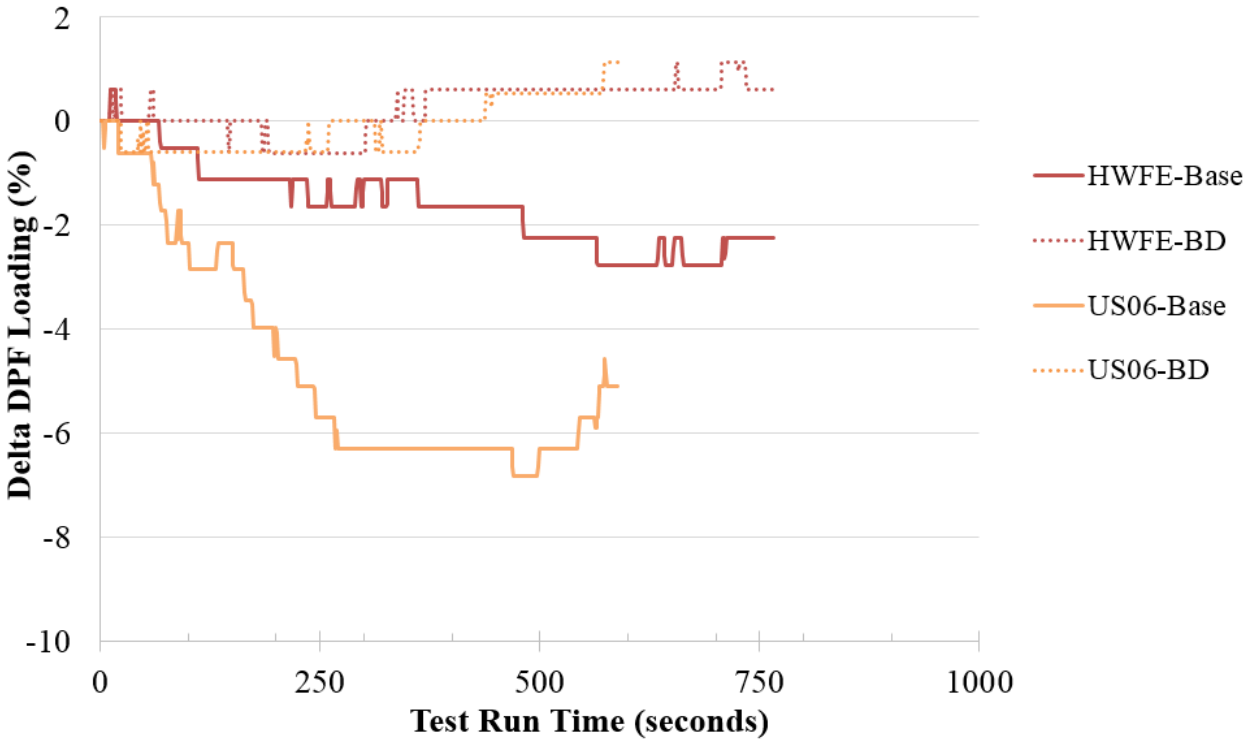


Figure 7. Inferred Delta DPF Loading (%) on the HWFE and US06 Tests

a. Commanded EGR

The EGR parameter is the commanded EGR duty cycle or position[24] which is directly related to the actual flow of recirculated exhaust gases through the EGR system (0 = valve closed/no flow, 100 = valve open/full flow). The live data showed that Bully Dog Extreme tuner did not disable the EGR system. Instead, there was an increase in the usage of EGR observed on all tests as shown in Figure 8. It is unknown if the tuner directly alters EGR operation or if the ECM responded to changes of other parameters made by the tuner by increasing the use of EGR. According to a document titled *6.7L Powerstroke Diesel Engine: Engine Description, Systems Overview, and Component Location*,[25] the commanded EGR is determined by intake pressure, engine load, engine temperature, exhaust pressure, and engine speed (RPM). See Sections IV.B.1.c and IV.B.1.d, respectively, for changes observed to intake pressure and calculated engine load.

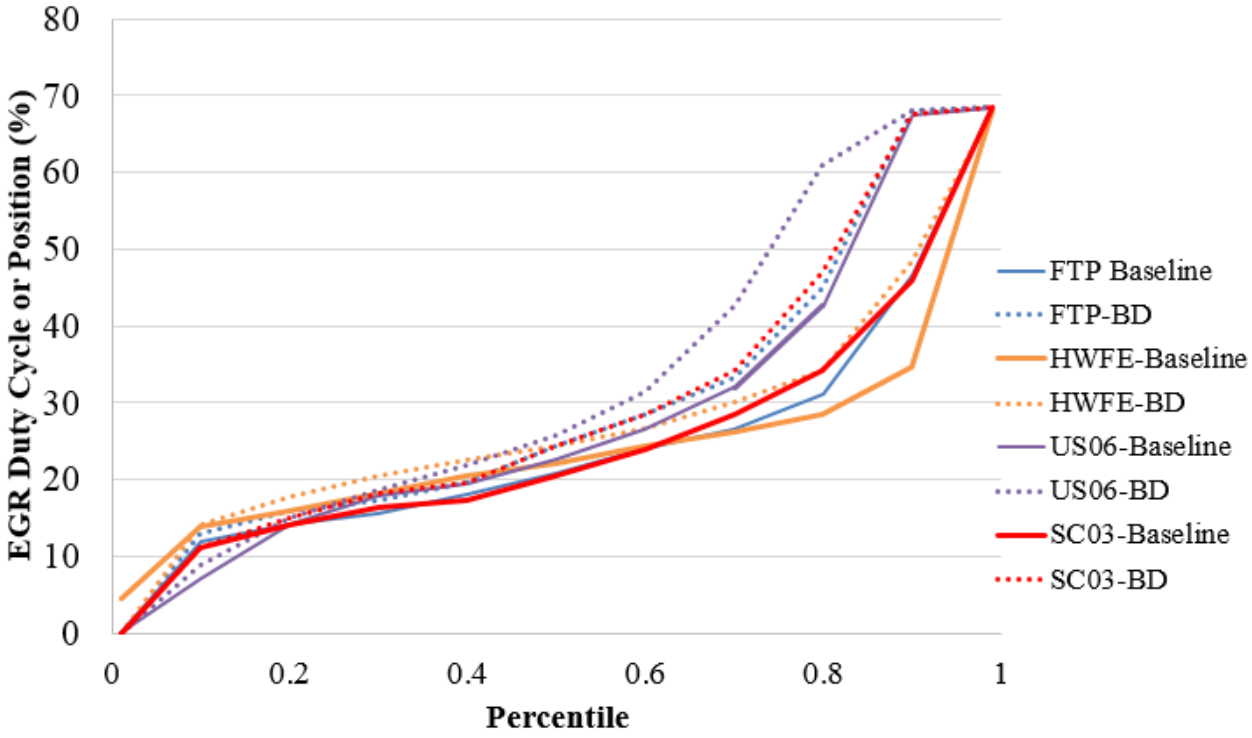


Figure 8. Actual EGR A Duty Cycle or Position (%) Data Logged from the F-250 Test Vehicle

b. SCR Ammonia Level

The live data show the Bully Dog Extreme tuner did not disable the SCR system. However, as shown in Figure 9, there was a decrease in the inferred SCR ammonia level[26] for all tests with the Bully Dog 40420 tuner installed with the exception of the SC03 test. However, as previously explained, fuel economy increased by 11 percent and reduced absolute load recorded with the data logger indicates the A/C was turned off during the Bully Dog SC03 test. ERG was not present during the Bully Dog SC03 test on 10

[24] Ford enhanced parameter FPID-469
[25] Available online at: http://www.ford-trucks.com/ford-manuals/6.7L_Diesel.pdf.
[26] This is Ford enhanced parameter FPID-047C. The EPA MSEB and ERG were unable to obtain information from Ford about the SCR ammonia (i.e., urea) level such as what the value represents, how the ECM calculates the value, and if the ECM uses it to monitor or control the SCR system.

November 2015 to confirm but was present for the baseline test on 28 October 2015 when it was turned on. Therefore, it is unknown if the lack of A/C operation on the Bully Dog SC03 test affected the inferred SCR ammonia level. It is also unknown if the accuracy of this inferred value is affected by other changes made by the tuner, if a possible increase in engine out NO_x emissions caused by the tuner depleted the SCR ammonia level, or if the tuner directly alters SCR operation by decreasing the ammonia dosing rate.

ERG also evaluated ammonia dosing rates collected by the data logger[27]; however, it was determined that the rates are calculated averages over a 48 hour period of engine operation or the period needed for a demanded reagent consumption of at least 15 liters, whichever is longer. Since each test was much shorter than these periods, the data was not useful for comparing dosing rates with the stock calibration (i.e., baseline) to dosing rates with the Bully Dog 40420 tuner installed.

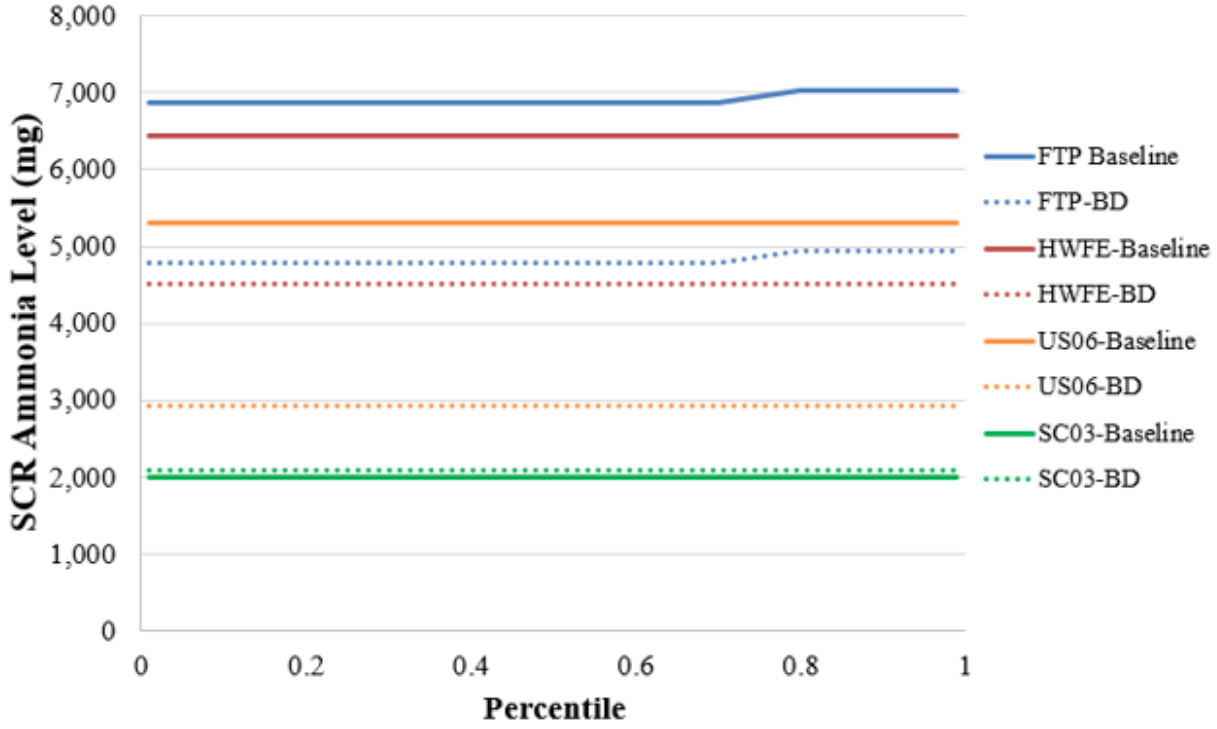


Figure 9. Inferred SCR Ammonia Level Data Logged from the F-250 Test Vehicle[28]

c. Manifold Absolute Pressure

The manifold absolute pressure (MAP) parameter[29] is the absolute pressure, in kilopascals (kPa), measured directly by a sensor in the intake manifold. As shown in Figure 10, the data indicate that there is an increase in MAP with the Bully Dog 40420 tuner installed on the FTP, US06, and SC03 tests but not on the HWFE test. According to a document titled *6.7L Powerstroke Diesel Engine: Engine Description, Systems Overview, and Component Location*,[30] the measured MAP is monitored by the ECM to control turbocharger, EGR, and DPF regeneration. Based on this information, a change in MAP may affect overall engine and/or emission control performance.

[27] Ford enhanced parameter FPID-F485
[28] Fuel economy increased by 11 percent and reduced absolute load recorded with the data logger indicates the A/C was turned off during the Bully Dog SC03 test. ERG was not present during this test on 10 November 2015 to confirm but was present for the baseline test on 28 October 2015 when it was turned on per the SC03 test procedure.
[29] Ford enhanced parameter FPID-F487.
[30] Available online at: http://www.ford-trucks.com/ford-manuals/6.7L_Diesel.pdf.

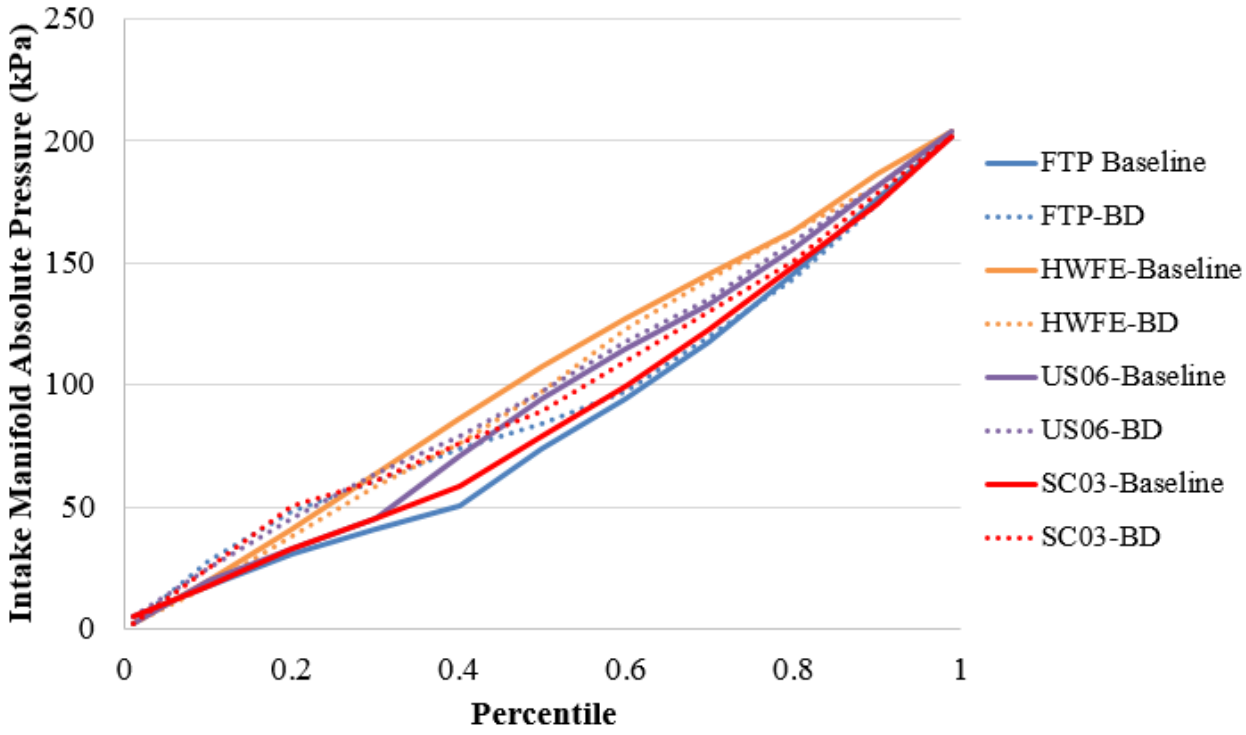


Figure 10. Manifold Absolute Pressure (kPa) Data Logged from the F-250 Test Vehicle[31]

d. Engine Load

The engine load[32] parameter represents the instantaneous engine load as a percentage of total possible engine load as a function of RPM. According SAE J1979, its calculation is proportional to the instantaneous air flow divided by the maximum air flow at wide open throttle as a function of engine RPM. However, it is unknown if this methodology is in fact used for this test vehicle since other methods may be used. As shown in Figure 11, the data show that there was a significant decrease in engine load with the Bully Dog 40420 tuner installed on all tests. According to a document titled *6.7L Powerstroke Diesel Engine: Engine Description, Systems Overview, and Component Location*,[33] the engine load on this test vehicle is used to control other systems important for emission control including the EGR, turbo charger, and fuel injection pressure. Based on this information, a change in engine load may affect overall engine and/or emission control performance.

[31] Fuel economy increased by 11 percent and reduced absolute load recorded with the data logger indicates the A/C was turned off during the Bully Dog SC03 test. ERG was not present during this test on 10 November 2015 to confirm but was present for the baseline test on 28 October 2015 when it was turned on per the SC03 test procedure.
[32] Ford enhanced parameter FPID-F404. ERG believes this is similar to SAE J1979 PID$04.
[33] Available online at: http://www.ford-trucks.com/ford-manuals/6.7L_Diesel.pdf.

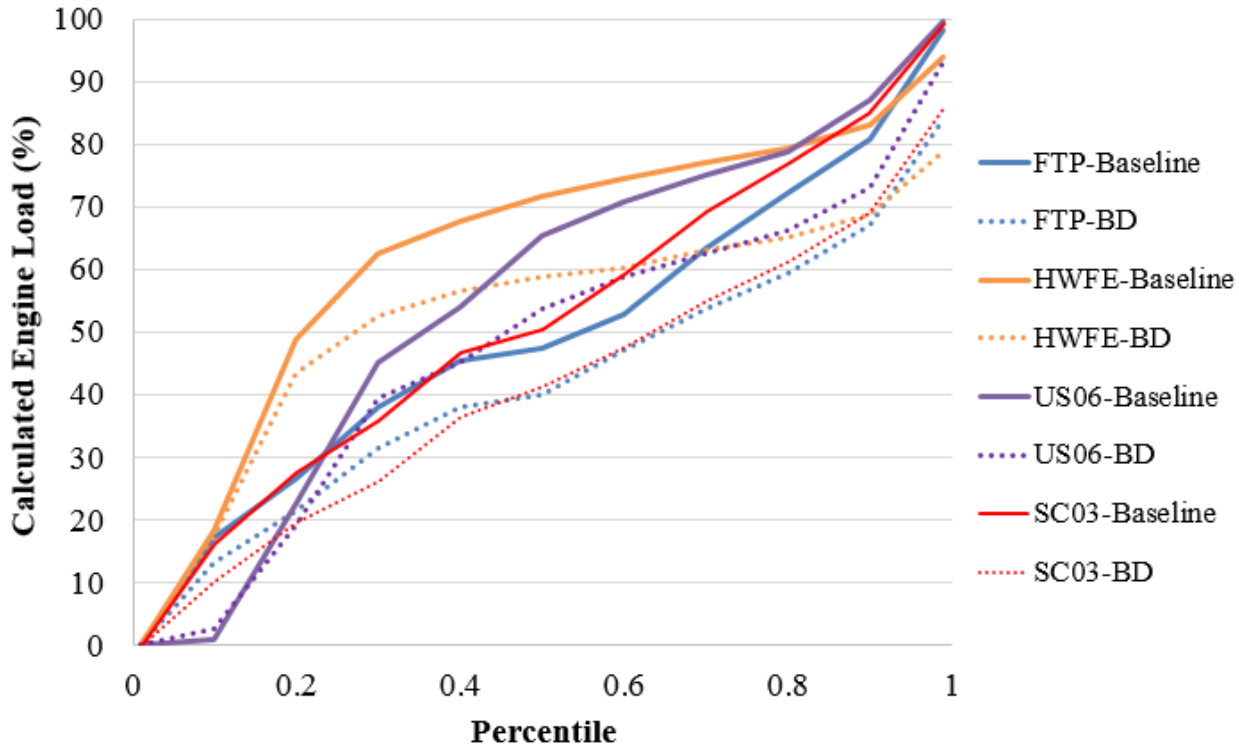


Figure 11. Engine Load (percent) Data Logged from the F-250 Test Vehicle[34]

e. Fuel Injection Timing

The fuel injection timing parameter[35] represents the point in which main fuel injection begins in degrees before (positive number) or after (negative number) top dead center. As shown in Figure 12, the data shows a small timing advance with the Bully Dog 40420 tuner installed on some of the test cycles. On the HWFE test, advancements in fuel injection timing were most apparent for a small portion of the test shown in the zero to 20th percentile range in Figure 12. Changes in fuel injection timing may have a direct impact on engine out NO_x emissions. However, The EPA and ERG were unable to log data related to fuel injection duration, which may also have an effect on emissions.

[34] Fuel economy increased by 11 percent and reduced absolute load recorded with the data logger indicates the A/C was turned off during the Bully Dog SC03 test. ERG was not present during this test on 10 November 2015 to confirm but was present for the baseline test on 28 October 2015 when it was turned on per the SC03 test procedure.
[35] Ford enhanced parameter FPID-F45D.

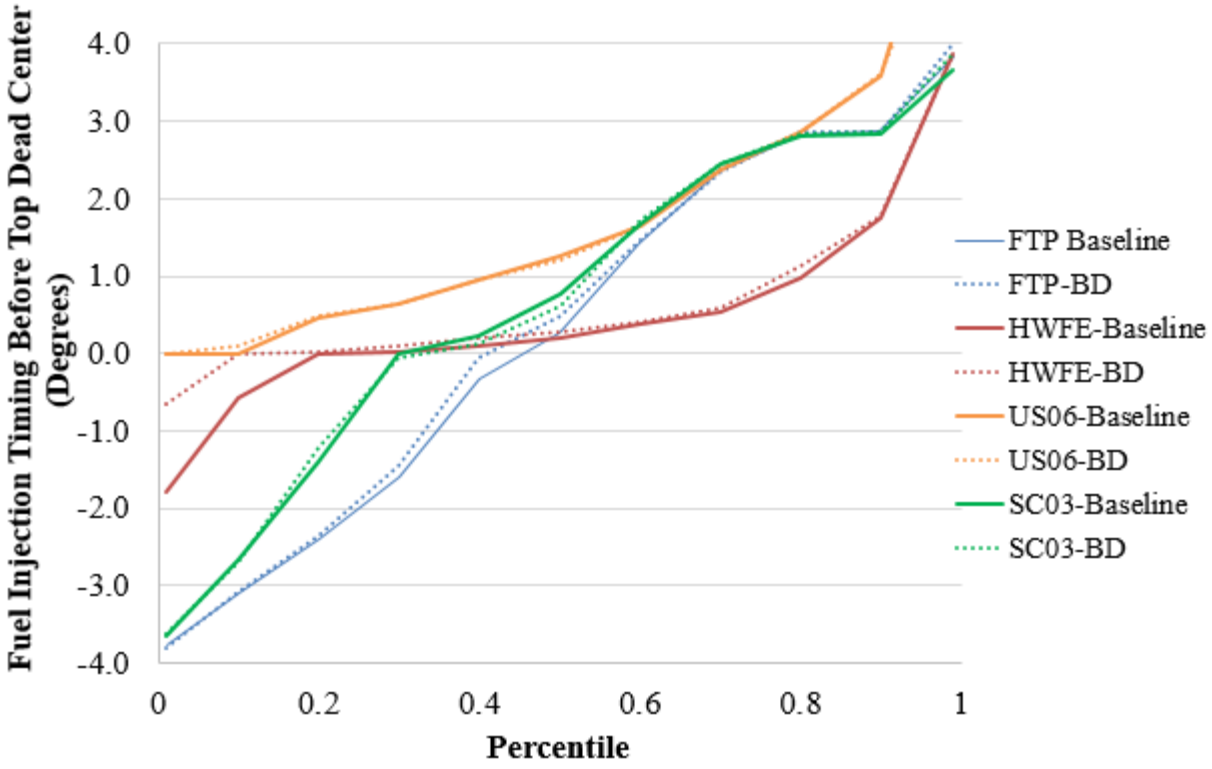


Figure 12. Fuel Injection Timing Data Logged from the F-250 Test Vehicle[36]

1. F-150 – 3.5 Liter Ford EcoBoost

ERG observed several changes to engine operation on the F-150 test vehicle with the SCT 7015 tuner installed compared to the baseline tests with the stock calibration installed. The parameters for which ERG identified changes are listed below and are discussed in the following subsections. Relevant figures and data tables are provided in these subsections, and Appendix G contains ERG's entire data analysis for the F-150 tests including more detailed descriptions of the data parameters.

- Engine load
- Long-term fuel trims

ERG also examined all other logged parameters for which no significant changes were identified with the SCT 7015 tuner installed, including manifold absolute pressure, catalyst temperature, commanded throttle actuator, commanded air-to-fuel ratio, fuel rail pressure, ignition timing advance, and short-term fuel trim.

a. Engine Load

The engine load parameter[37] represents the instantaneous engine load as a percentage of total possible engine load as a function of RPM. According SAE J1979, its calculation is proportional to the instantaneous air flow divided by the maximum air flow at wide open throttle as a function of engine RPM. However, it is unknown if this methodology is in fact used for this test vehicle since other methods may be used. As shown in Figure 13, the data show that there was a significant decrease in engine load with the SCT 7015 tuner installed on all tests.

[36] Fuel economy increased by 11 percent and reduced absolute load recorded with the data logger indicates the A/C was turned off during the Bully Dog SC03 test. ERG was not present during this test on 10 November 2015 to confirm but was present for the baseline test on 28 October 2015 when it was turned on per the SC03 test procedure.
[37] SAE J1979 parameter PID$04

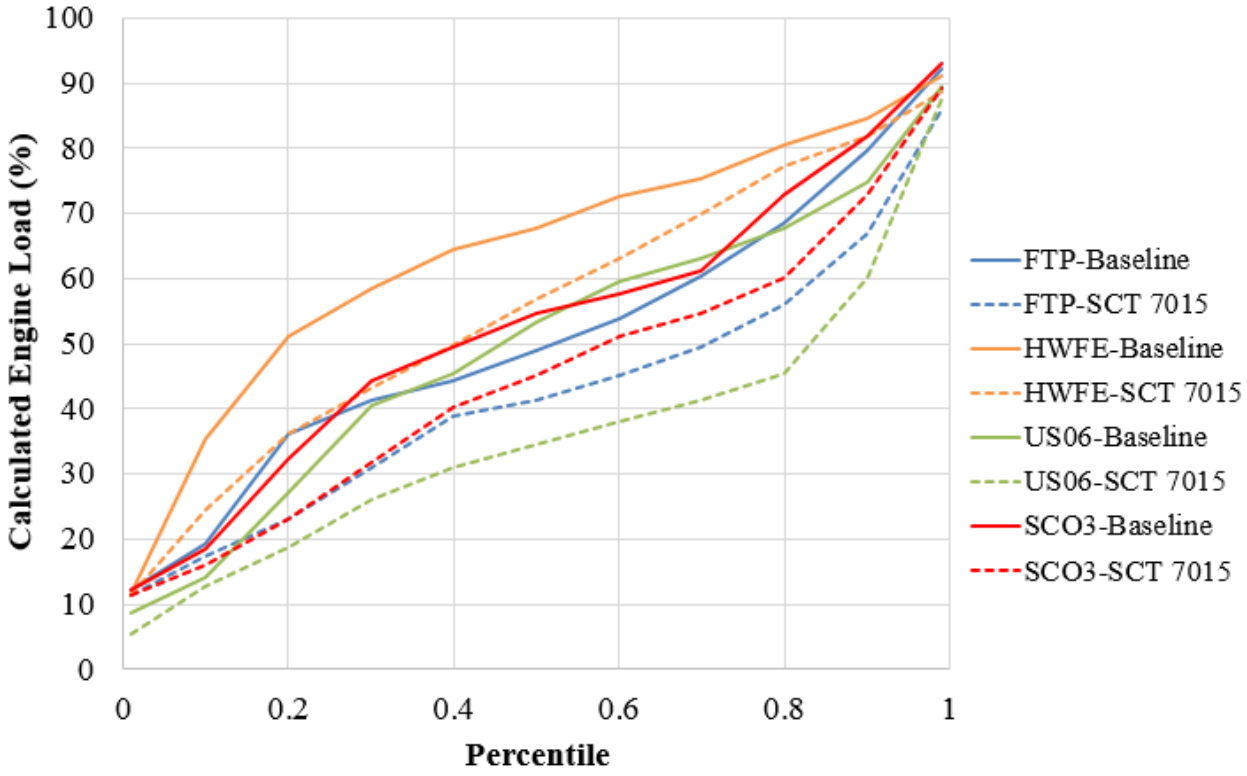


Figure 13. Calculated Engine Load (percent) Data Logged from the F-150 Test Vehicle

a. Long-term Fuel Trims

The long-term fuel trim parameter[38] represents the percent change in long-term fuel trims (i.e., a positive value is a change to more fuel input, a negative value is a change to less fuel input). As shown in Figure 14, the data show that there was a significant decrease in long-term fuel trim with the Bully Dog 40420 tuner installed on all tests. As fuel trim represents a change in injector duration (and, hence, volume of fuel provided to the engine), a change in a vehicle's fuel trim may affect emission control performance and the longevity of emission control components, in particular the catalytic converter.

[38] SAE J1979 parameter PID$07

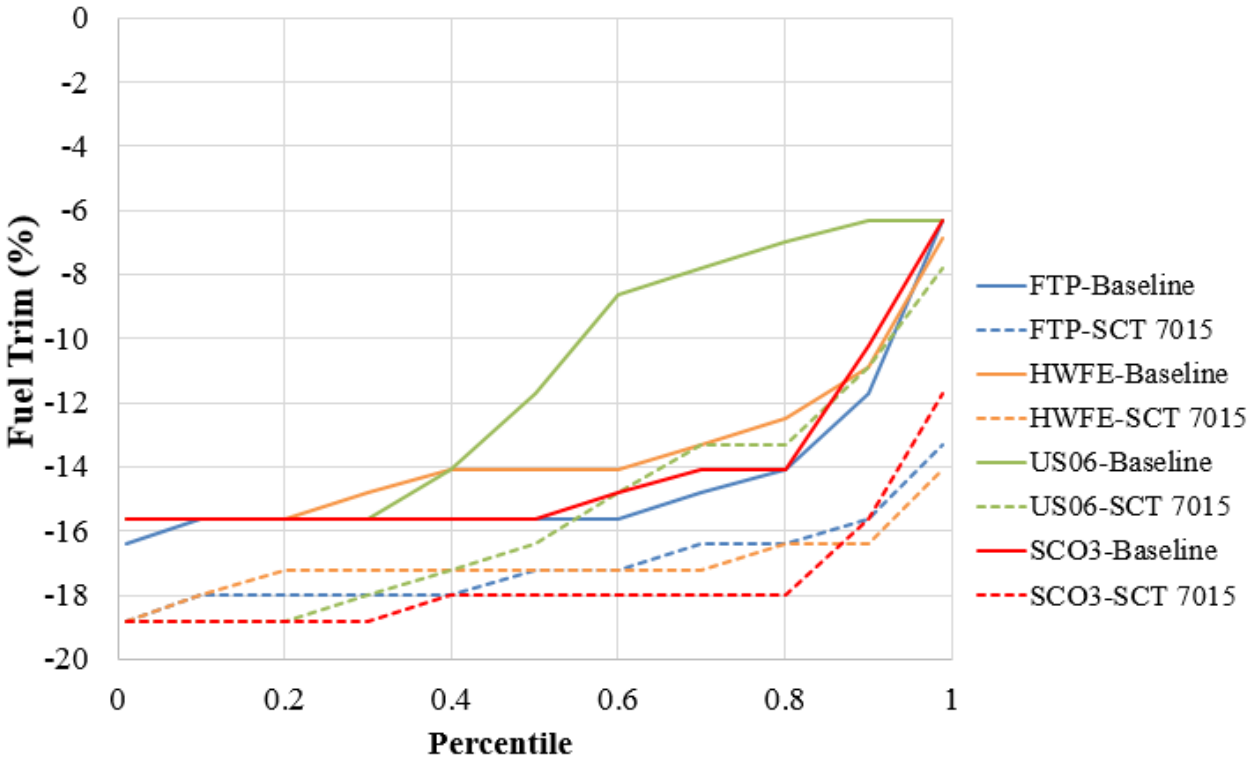


Figure 14. Long-term Fuel Trim (percent) Data Logged from the F-150 Test Vehicle

C. Measured Emissions Results

The following sections summarize the results from emissions testing at EPA's testing facility using a chassis dynamometer. Table 8 and Table 9 in Section III.C (Quality Assurance and Other Documentation) discusses dynamometer calibration settings, test identification numbers, and other information documenting the emission results discussed in this section.

1. F-250 – 6.7 Liter Ford Powerstroke

Table 14 summarizes the baseline (i.e., stock calibration) emission results for the F-250 test vehicle and the results with the Bully Dog 40420 tuner installed. As described in Section III.B.1.a, ERG kept the tuner in the "extreme" shift on-the-fly power level at all times when the tuner was installed on the F-250. EPA measured CO, CO_2, NO_x, NMHC, particulate matter (PM), and calculated fuel economy for each calibration on the FTP, HWFE, US06, and SC03 drive cycles. Results are presented in Table 14. The emissions results are organized by test and calibration. The certified emission levels for this particular engine family are also provided. Additional details on emissions testing and results are provided in Appendices D.

As shown in Table 14, EPA measured 0.295 grams of NO_x per mile on the FTP test with the Bully Dog 40420 tuner installed. This is greater than the applicable standard of 0.2 grams per mile for this engine family set forth in 40 CFR Part 86 and is nearly three times higher than the measured value from the baseline (i.e., stock calibration) FTP test (0.107 grams per mile). When Ford certified this engine family, they measured 0.12 grams of NO_x per mile on the FTP test and certified it at 0.2 grams per mile after applying the appropriate adjustment factors (i.e., deterioration and EAF, See Section III.A). Increases in NO_x emissions over the HWFE and US06 tests were also observed with the Bully Dog 40420 tuner installed but there are no applicable exhaust standard for this engine family on those tests.

Table 14. FTP Emissions Results for MY 2012 F-250 with a 6.7 Liter Powerstroke Diesel Engine with the Bully Dog 40420 Tuner (Extreme Setting)

Test	Measured Results[a] (g/mi, unless otherwise noted)				CFMXD06.761A Cert. Information (120,000 miles)[b]				
	Pollutant	Baseline (i.e., stock)	BD Extreme	Percent Change	Measured FTP Result (new vehicle)	Upward EAF	DF	Useful Life Cert. Level	Useful Life Cert. Standard
FTP	CO	0.689	0.904	31%	0.35000	0.01000	0.2100	0.6000	7.3
	NO_x	0.107	0.295	177%	0.12000	0.01000	0.0500	0.2000	0.2
	NMHC	0.071	0.100	41%	0.03280	0.00110	0.0192	0.0530	0.195
	PM[c]	0.000154	0.000317	106%	0.00500	-0.00010	0.0050	0.0100	0.02
	FE (mpg)	14.13	14.46	2%	N/A - No standards apply for this vehicle and test				
HWFE	CO	0.014	0.015	7%					
	NO_x	0.009	0.036	300%					
	NMHC	0.004	0.000	-100%					
	PM	0.00020	0.00030	53%					
	FE (mpg)	23.43	23.62	1%					
US06	CO	0.018	0.019	6%					
	NO_x	0.199	0.442	122%					
	NMHC	0.001	0.000	-100%					
	PM	0.00053	0.00025	-53%					
	FE (mpg)	16.92	17.64	4%					
SC03	CO	0.026	0.034	31%					
	NO_x	0.649	0.630	-3%					
	NMHC	0.009	0.008	-11%					
	PM	0.00088	0.00094	6%					
	FE (mpg)	14.08	15.59	11%					

Red – FTP NO_x emission levels exceeded the applicable standard to which this engine was certified with the Bully Dog 40420 tuner installed.
Orange – Observed increases in NO_x on the HWFE and US06. However, there are no applicable exhaust standard for this engine family on those tests.
Blue – Fuel economy increased by 11 percent and reduced absolute load recorded with the data logger indicates the A/C was turned off during the Bully Dog SC03 test. ERG was not present during this test on 10 November 2015 to confirm but was present for the baseline test on 28 October 2015 when it was turned on per the SC03 test procedure.
a – All results are rounded to three decimal places unless fewer decimal places were reported in the Appendix D laboratory test reports. PM results are rounded to six decimal places because of the raw results were in milligrams per mile and ERG converted them to grams per mile.
b – All engine certification data, including the number of decimal places, are shown as reported by OTAQ (http://www3.epa.gov/otaq/documents/eng-cert/on-hwy-2012b.xls).
c – Despite the large increase in PM on the FTP test with the Bully Dog tuner installed compared to stock, all PM results are well below the useful life standard.

1. F-150 – 3.5 Liter Ford EcoBoost

Table 15 summarizes the baseline (i.e., stock calibration) emission results for the F-150 test vehicle and the results with the SCT 7015 tuner installed. EPA measured CO, NO_x, NMHC, and fuel economy for each calibration on the FTP, HWFE, US06, and SC03 tests. The emissions results are organized by test and calibration. The certified emission levels reported by Ford for this particular engine family are also provided. As shown in Table 15, none of the measured emissions exceeded certification standards with the SCT 7015 tuner installed.

Table 15. Emissions Results MY 2013 F-150 with a 3.5 Liter EcoBoost Gasoline Engine with the SCT 7015 93 Octane Performance Tune

Test	Results (g/mi, unless otherwise noted)				DFMXT03.54DX Cert. Info. (50,000 miles)				DFMXT03.54DX Cert. Info. (120,000 miles)			
	Pollutant	**Baseline**	**SCT 93 Octane Perf.**	**Percent Change**	**Measured FTP Result (new vehicle)**	**Upward EAF**	**DF**	**Useful Life Cert. Level**	**Measured FTP Result (new vehicle)**	**Upward EAF**	**DF**	**Useful Life Cert. Level**
FTP	CO	0.536	0.578	8%	0.68	0.25	0.9	3.4	0.68	0.63	1.3	4.2
	NO_x	0.017	0.023	36%	0.008	0.004	0.01	0.05	0.008	0.011	0.02	0.07
	HMHC	0.024	0.023	-7%	0.0262	0.01	0.036	0.075	0.0262	0.0251	0.051	0.090
	FE (mpg)	15.57	15.65	1%	N/A - No standards apply.				N/A - No standards apply.			
HWFE	CO	0.063	0.108	71%								
	NO_x	0.004	0.005	25%	0.003	0.004	0.01	0.07	0.0028	0.011	0.014	0.090
	HMHC	0.001	0.002	100%	N/A - No standards apply.				N/A - No standards apply.			
	FE (mpg)	23.85	24.14	1%								
US06	CO	1.02	8.75	762%	N/A - No standards apply.				0.66	0.63	1.3	19.3
	NO_x	0.107	0.053	-50%	N/A - No standards apply.				N/A - No standards apply.			
	HMHC	0.020	.054	170%								
	FE (mpg)	17.54	17.23	-2%								
SC03	CO	0.856	0.545	-36%	N/A - No standards apply.				0.43	0.63	1.1	6.4
	NO_x	0.060	0.056	-7%	N/A - No standards apply.				N/A - No standards apply.			
	HMHC	0.015	0.013	-13%								
	FE (mpg)	15.26	15.27	0%								

Blue – Tailpipe backpressure outside the allowable 5" H_2O pressure draw; results cannot be validated.

APPENDIX A
PHOTOGRAPH LOG

PHOTOGRAPH #: 1	
TAKEN BY: B. Ruminski	**SITE LOCATION:** ERG Chantilly, Virginia Office
DATE TAKEN: 8/13/2015	
COMMENTS: Bully Dog 40420 tuner that ERG purchased directly from Punch-It during the inspection on 4 August 2015. This unit was shipped directly from Bully Dog to ERG.	

PHOTOGRAPH #: 2	
TAKEN BY: B. Ruminski	**SITE LOCATION:** ERG Chantilly, Virginia Office
DATE TAKEN: 8/13/2015	
COMMENTS: Back of the Bully Dog 40420 tuner showing the tuner serial number (30V6S0F7L000T).	

PHOTOGRAPH #: 3	
TAKEN BY: B. Ruminski	**SITE LOCATION:** ERG Chantilly, Virginia Office
DATE TAKEN: 8/13/2015	
COMMENTS: Bottom of the package containing the Bully Dog 40420 tuner that lists the vehicle and engine applications.	

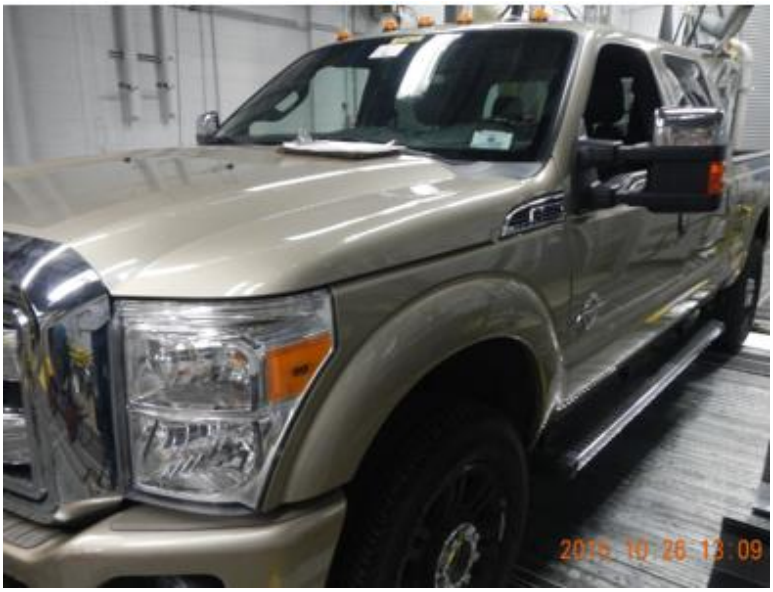
PHOTOGRAPH #: 4	
TAKEN BY: B. Ruminski	**SITE LOCATION:** ERG Chantilly, Virginia Office
DATE TAKEN: 8/13/2015	
COMMENTS: Bottom of the package showing the Bully Dog 40420 tuner UPC, part number, serial number (30V6S0F7L000T), and version number (V 1.2.0.0)	

PHOTOGRAPH #: 5	
TAKEN BY: B. Ruminski	**SITE LOCATION:** ERG Chantilly, Virginia Office
DATE TAKEN: 8/13/2015	
COMMENTS: Contents of Bully Dog 40420 tuner package	

PHOTOGRAPH #: 6	
TAKEN BY: B. Ruminski	**SITE LOCATION:** ERG Chantilly, Virginia Office
DATE TAKEN: 8/13/2015	
COMMENTS: SCT 7015 tuner ERG purchased directly from Punch-It during the inspection on 4 August 2015. ERG took possession during the inspection.	

PHOTOGRAPH #: 7	
TAKEN BY: B. Ruminski	**SITE LOCATION:** ERG Chantilly, Virginia Office
DATE TAKEN: 8/13/2015	
COMMENTS: Bottom of the SCT 7015 tuner box showing the unit's serial number (X40717156ECA5) and SCT UPC.	

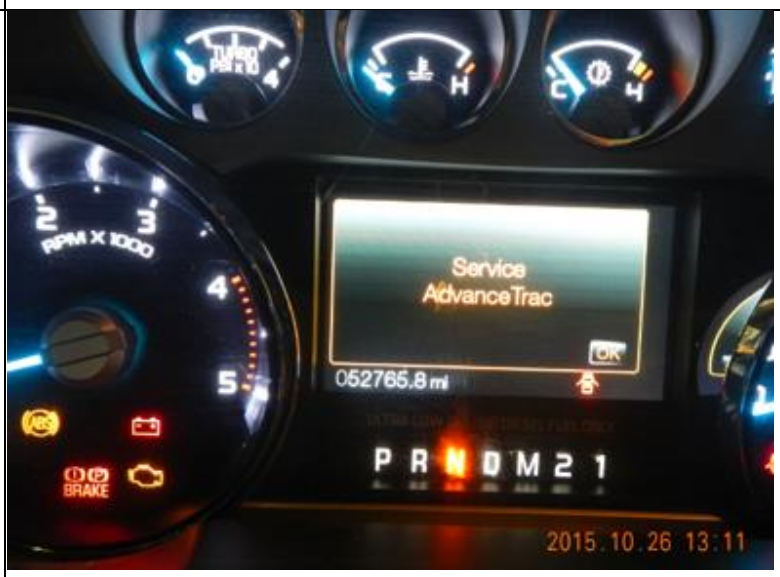
PHOTOGRAPH #: 8	
TAKEN BY: B. Ruminski	**SITE LOCATION:** ERG Chantilly, Virginia Office
DATE TAKEN: 8/13/2015	
COMMENTS: Back of the SCT 7015 tuner showing the unit's serial number (X40717156ECA5).	

PHOTOGRAPH #: 9	
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 10/26/2015	
COMMENTS: General overview of MY 2012 F-250 test vehicle with a 6.7 Liter Ford Powerstroke diesel engine.	

PHOTOGRAPH #:	10
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 10/26/2015	
COMMENTS: VIN of 2012 F-250 test vehicle.	

PHOTOGRAPH #: 11	
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 10/26/2015	
COMMENTS: Chassis label Engine label of 2012 F-250 test vehicle.	

PHOTOGRAPH #: 12	
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 10/26/2015	
COMMENTS: Engine label of 2012 F-250 test vehicle.	

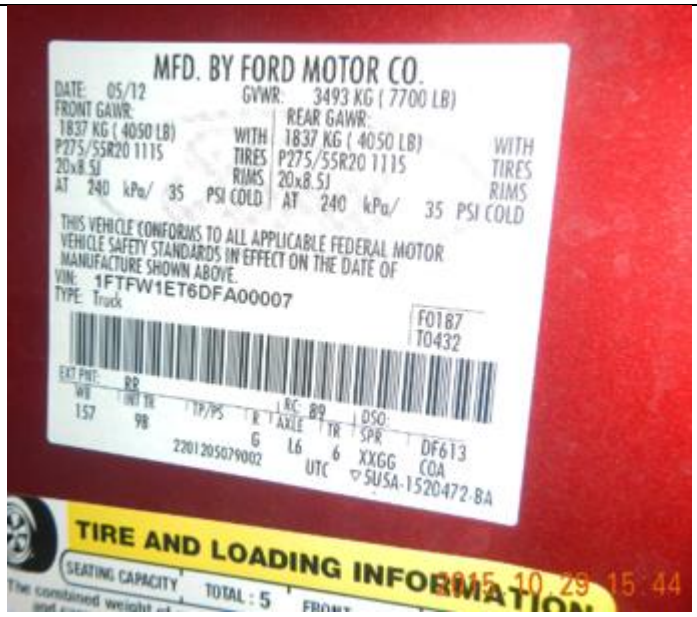
PHOTOGRAPH #: 13	
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 10/26/2015	
COMMENTS: Odometer reading on the 2012 F-250 test vehicle prior to any testing.	

PHOTOGRAPH #: 14	
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 10/26/2015	
COMMENTS: Stock aftertreatment system on the 2012 F-250 test vehicle containing a DOC, SCR, and DPF	

PHOTOGRAPH #: 15	
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 10/26/2015	
COMMENTS: Engine compartment of F-250 test vehicle with a 6.7 Liter Ford Powerstroke diesel engine showing factory EGR system.	

PHOTOGRAPH #: 16	
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 10/29/2015	
COMMENTS: General overview of 2013 F-150 test vehicle with a 3.5 Liter EcoBoost engine.	

PHOTOGRAPH #:	17
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 11/3/2015	
COMMENTS: VIN of 2013 F-150 test vehicle.	

PHOTOGRAPH #:	18
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 10/29/2015	
COMMENTS: Chassis label Engine label of 2013 F-150 test vehicle.	

PHOTOGRAPH #: 19	
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 10/29/2015	
COMMENTS: Odometer reading on the 2013 F-150 test vehicle prior to any testing.	

PHOTOGRAPH #: 20	
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 11/5/2015	
COMMENTS: Passenger side catalyst on the 2013 F-150 test vehicle.	

PHOTOGRAPH #: 21	
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 11/5/2015	
COMMENTS: Driver side catalyst on the 2013 F-150 test vehicle.	

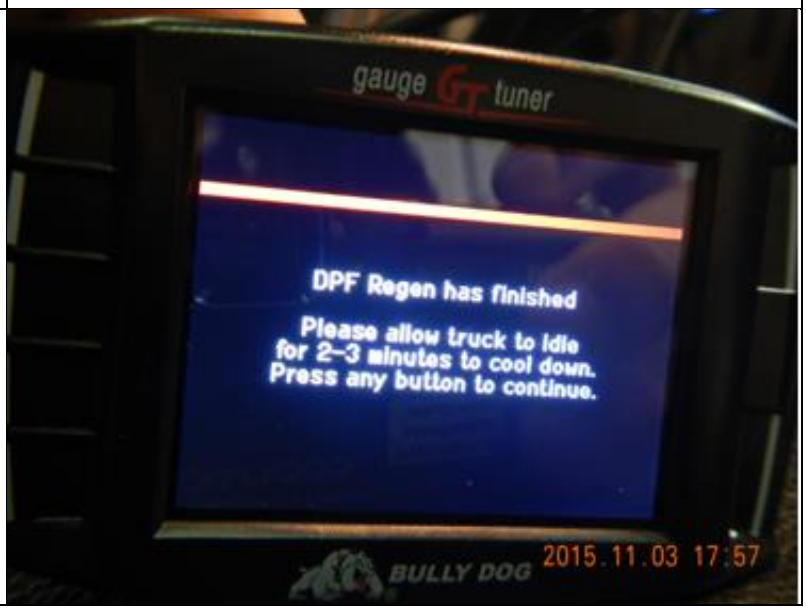
PHOTOGRAPH #: 22	
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 10/29/2015	
COMMENTS: Engine compartment of F-150 test vehicle with a 3.5 Liter EcoBoost.	

PHOTOGRAPH #: 23	
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 11/3/2015	
COMMENTS: Manual DPF regeneration feature on the Bully Dog 40420 tuner when installed on the F-250 tests vehicle.	

PHOTOGRAPH #: 24	
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 11/3/2015	
COMMENTS: Manual DPF regeneration method showing the two options for the type of DPF regeneration to force.	

PHOTOGRAPH #: 25	
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 11/3/2015	
COMMENTS: DPF loading at the beginning of the manual DPF regeneration process forced by ERG using the Bully Dog 40420 tuner on the F-250 test vehicle on 3 November 2015.	

PHOTOGRAPH #: 26	
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 11/3/2015	
COMMENTS: DPF loading at the end of the manual DPF regeneration process forced by ERG using the Bully Dog 40420 tuner on the F-250 test vehicle on 3 November 2015.	

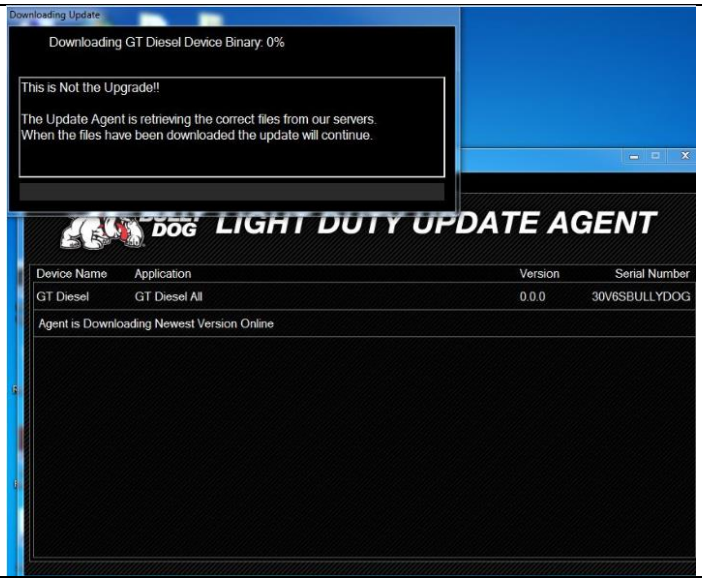
PHOTOGRAPH #: 27	
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 11/3/2015	
COMMENTS: Prompt observed at the end of the manual DPF regeneration process forced by ERG using the Bully Dog 40420 tuner on the F-250 test vehicle on 3 November 2015.	

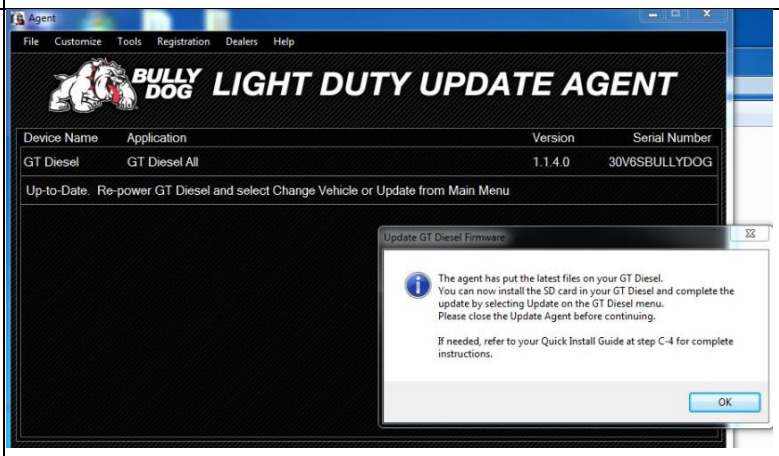
PHOTOGRAPH #: 28	
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 10/28/2015	
COMMENTS: Bully Dog 40420 tuner screen when first plugged in to vehicle.	

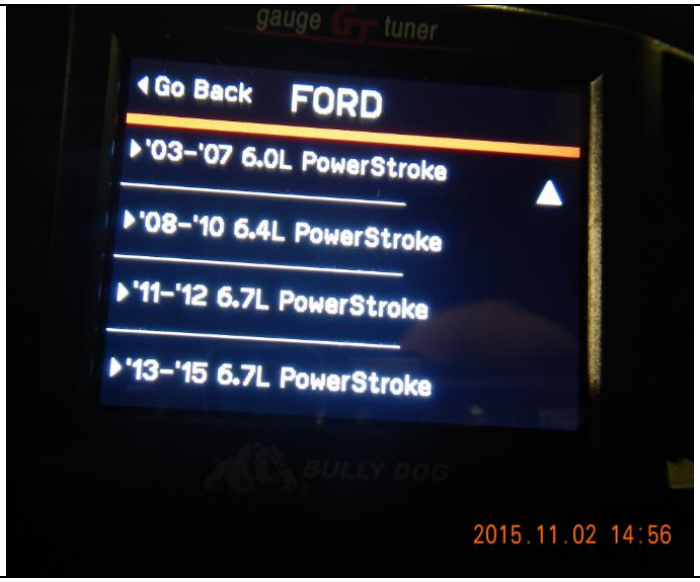
PHOTOGRAPH #: 29	
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 10/28/2015	
COMMENTS: Bully Dog 40420 tuner screen when first plugged in to vehicle.	

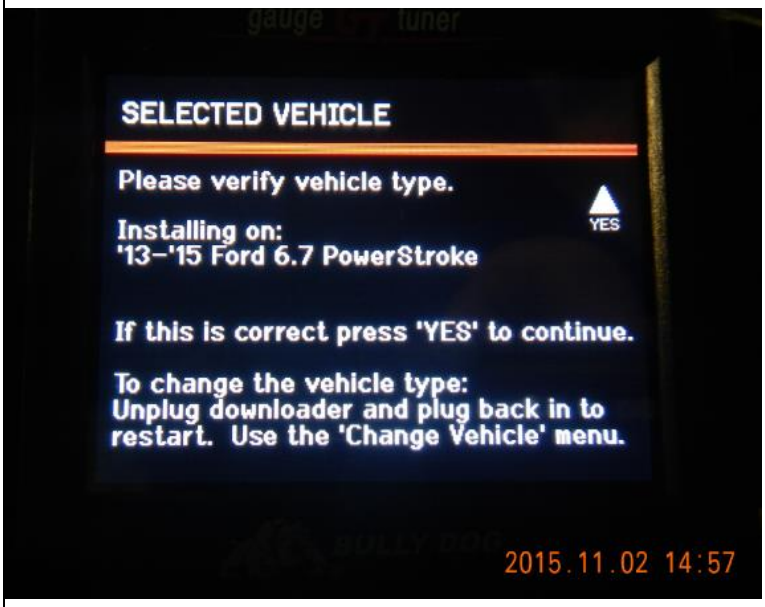
PHOTOGRAPH #: 30	
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 10/28/2015	
COMMENTS: Bully Dog 40420 tuner screen when first plugged in to vehicle.	

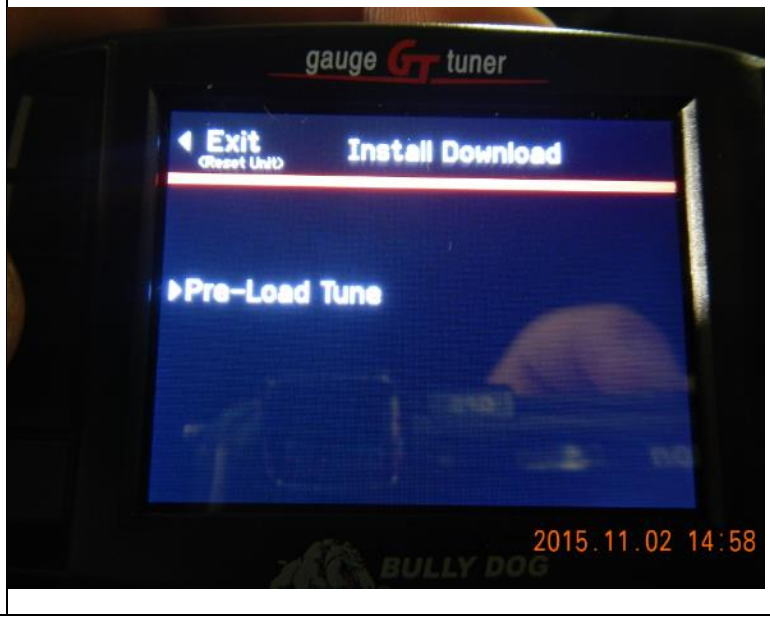
PHOTOGRAPH #: 31	
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 10/28/2015	
COMMENTS: Error message ERG initially received when trying to install the Bully Dog 40420 tuner on the F-250 test vehicle.	

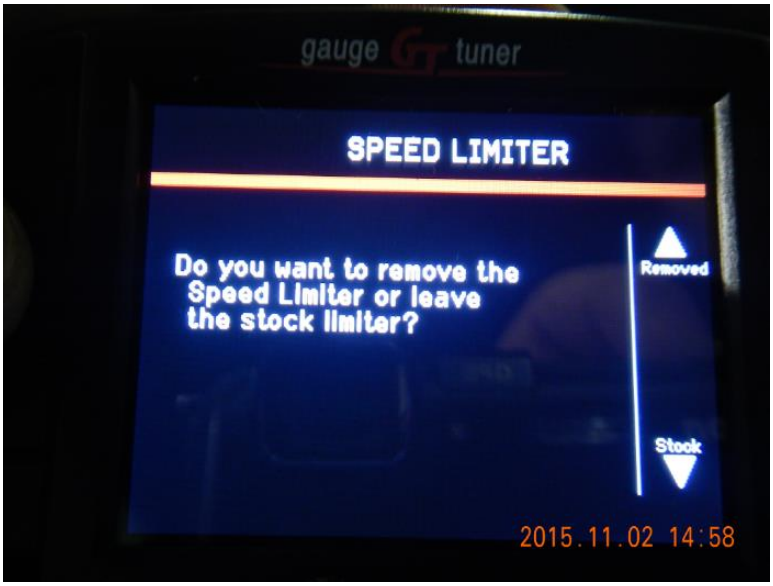
PHOTOGRAPH #: 32	
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 10/28/2015	
COMMENTS: Screen shot of ERG updating the Bully Dog 40420 on a lap top computer as a result of the error message during initial installation.	

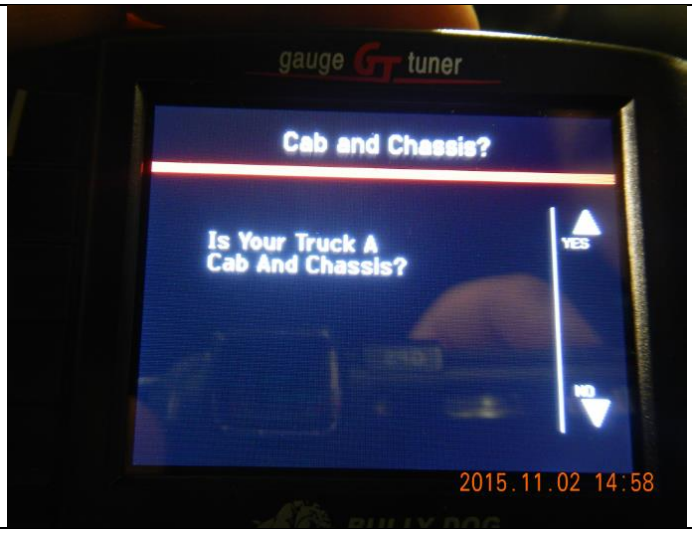
PHOTOGRAPH #: 33	
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 10/28/2015	
COMMENTS: Screen shot of ERG updating the Bully Dog 40420 tuner on a lap top computer as a result of the error message during initial installation.	

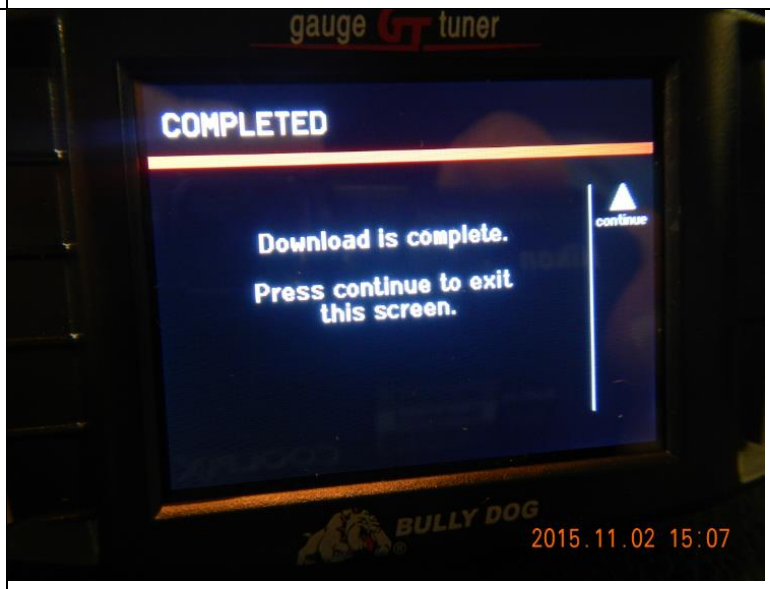
PHOTOGRAPH #: 34	
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 11/2/2015	
COMMENTS: Installation prompt when installing the Bully Dog 40420 tuner on the F-250 test vehicle.	

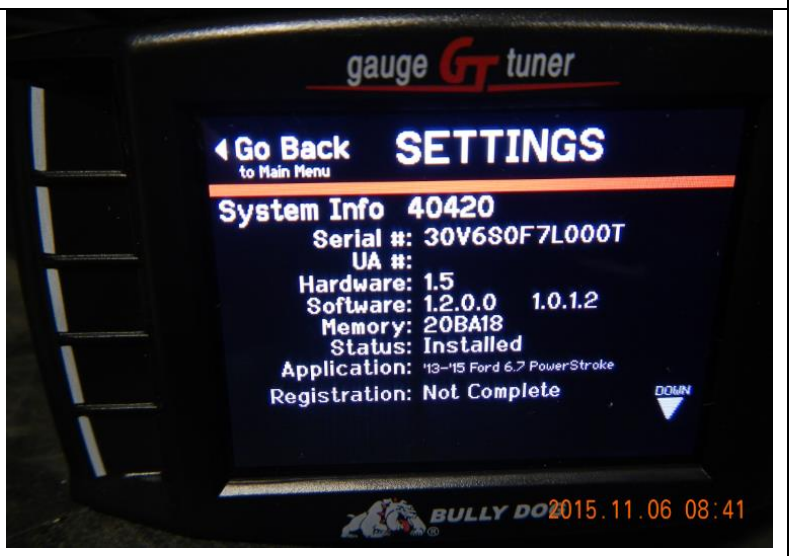
PHOTOGRAPH #: 35	
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 11/2/2015	
COMMENTS: Installation prompt when installing the Bully Dog 40420 tuner on the F-250 test vehicle.	

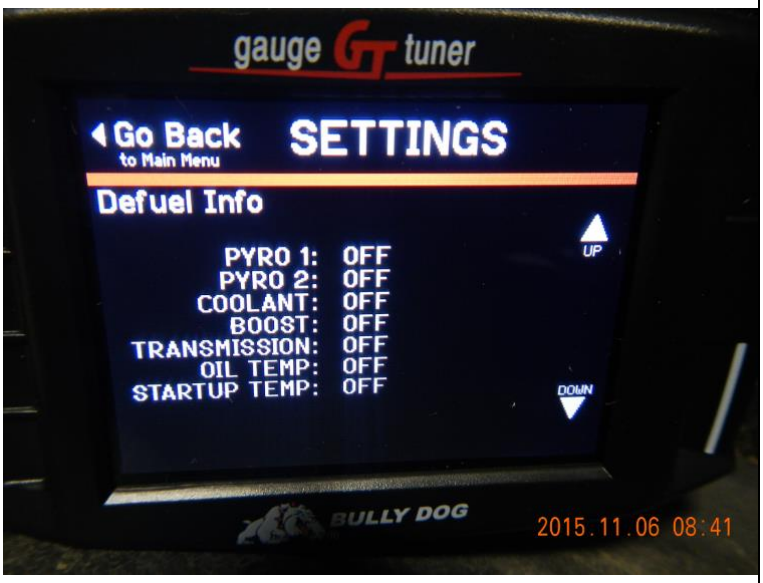
PHOTOGRAPH #: 36	
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 11/2/2015	
COMMENTS: Installation prompt when installing the Bully Dog 40420 tuner on the F-250 test vehicle.	

PHOTOGRAPH #: 37	
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 11/2/2015	
COMMENTS: Installation prompt when installing the Bully Dog 40420 tuner on the F-250 test vehicle.	

PHOTOGRAPH #: 38	
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 11/2/2015	
COMMENTS: Installation prompt when installing the Bully Dog 40420 tuner on the F-250 test vehicle.	

PHOTOGRAPH #: 39	
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 11/2/2015	
COMMENTS: Installation prompt when installing the Bully Dog 40420 tuner on the F-250 test vehicle.	

PHOTOGRAPH #: 40	
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 11/6/2015	
COMMENTS: Final settings of Bully Dog 40420 tuner (screen 1 of 2) immediately before first the first Bully Dog test sequence.	

PHOTOGRAPH #: 41	
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 11/6/2015	
COMMENTS: Final settings of Bully Dog 40420 tuner (screen 2 of 2) immediately before first the first Bully Dog test sequence.	

PHOTOGRAPH #: 42	
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 11/2/2015	
COMMENTS: Main screen of Bully Dog 40420 tuner after installation on the F-250 test vehicle.	

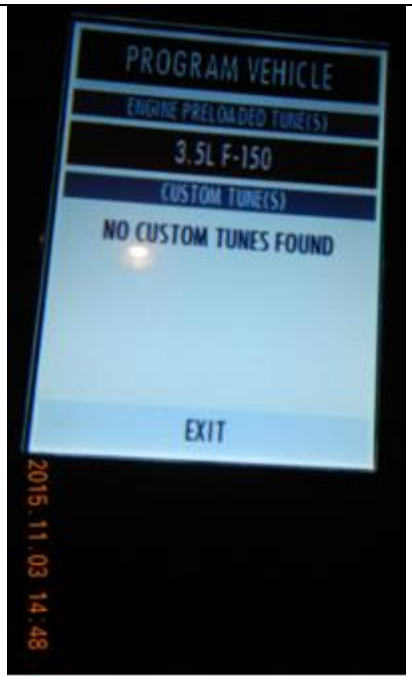
PHOTOGRAPH #: 43	
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 11/3/2015	
COMMENTS: SCT 7015 tuner plugged into the F-150 test vehicle OBD port.	

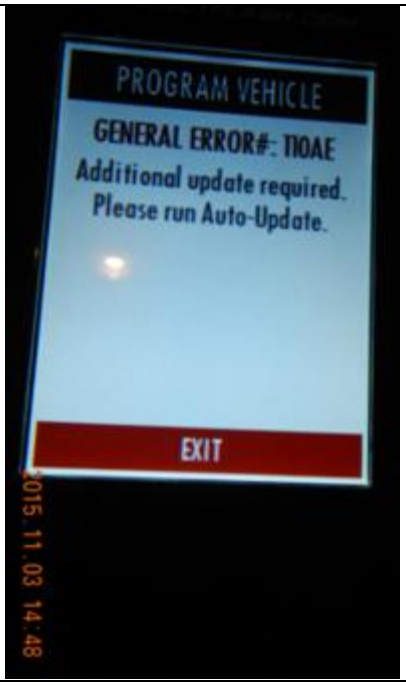
PHOTOGRAPH #: 44	
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 11/3/2015	
COMMENTS: Device information screen of SCT 7015 tuner (screens - 1-2 of 4) prior to installation on test vehicle.	

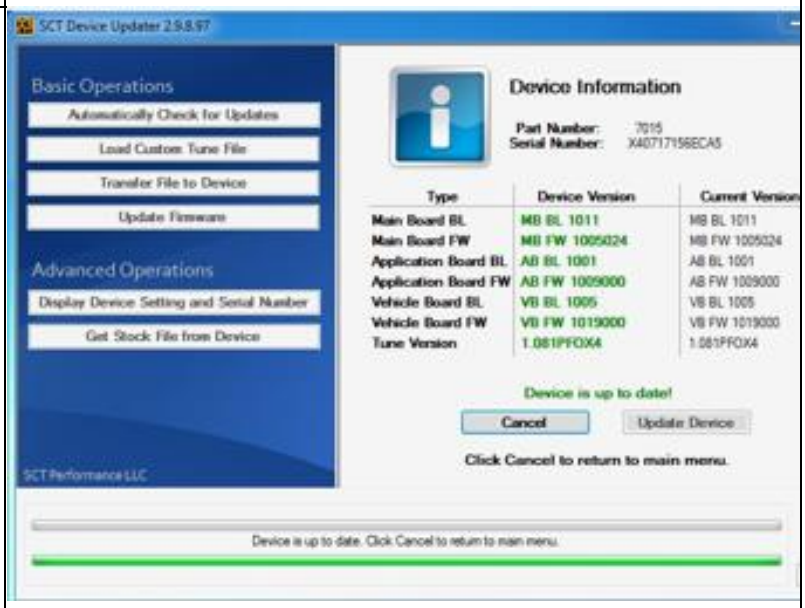
PHOTOGRAPH #: 45	
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 11/3/2015	
COMMENTS: Device information screen of SCT 7015 tuner (screens 3 and 4 of 4) prior to installation on test vehicle.	

PHOTOGRAPH #: 46	
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 11/3/2015	
COMMENTS: Vehicle information screen of SCT 7015 tuner prior to installation on test vehicle.	

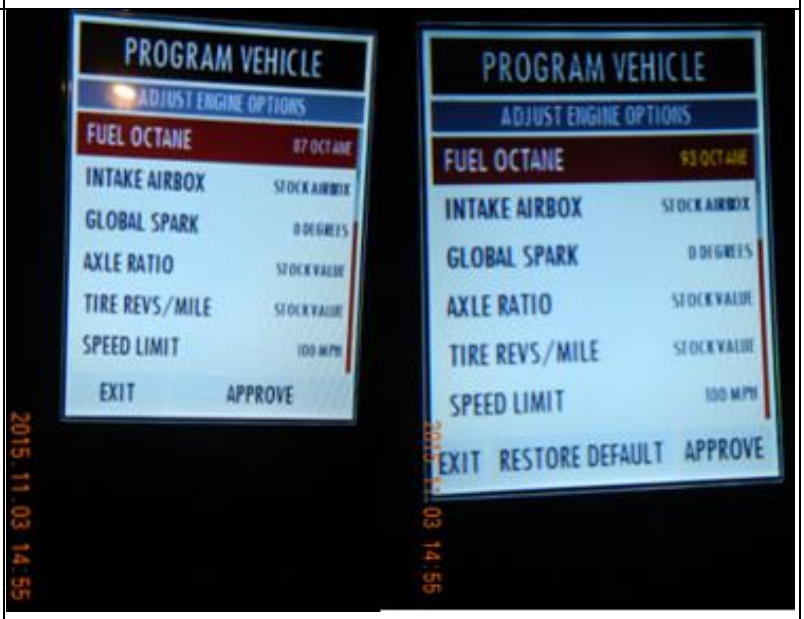
PHOTOGRAPH #: 47	
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 11/3/2015	
COMMENTS: Street use notice prompted at the beginning of the program vehicle process on the SCT 7015 tuner.	

PHOTOGRAPH #: 48	
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 11/3/2015	
COMMENTS: Program vehicle screen of the SCT 7015 tuner on the F-150 test vehicle showing recognition of the F-150 3.5 Liter engine indicating that the tune only has preloaded tunes from SCT and no custom tunes.	

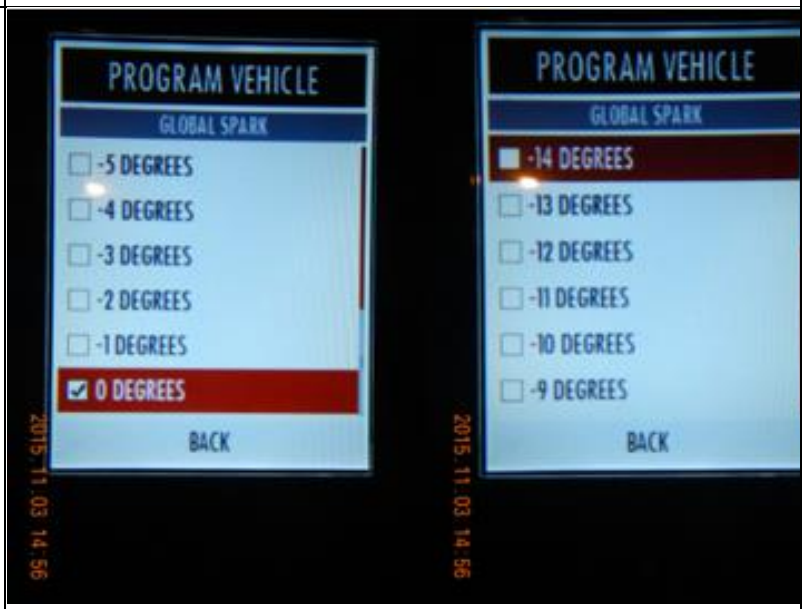
PHOTOGRAPH #: 49	
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 11/3/2015	
COMMENTS: Error message ERG initially received when trying to install the SCT 7015 tuner on the F-150 test vehicle.	

PHOTOGRAPH #: 50	
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 11/3/2015	
COMMENTS: Screen shot of ERG updating the SCT 7015 tuner on a lap top computer.	

PHOTOGRAPH #: 51	
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 11/3/2015	
COMMENTS: Screen shot of ERG updating the SCT 7015 tuner on a lap top computer.	

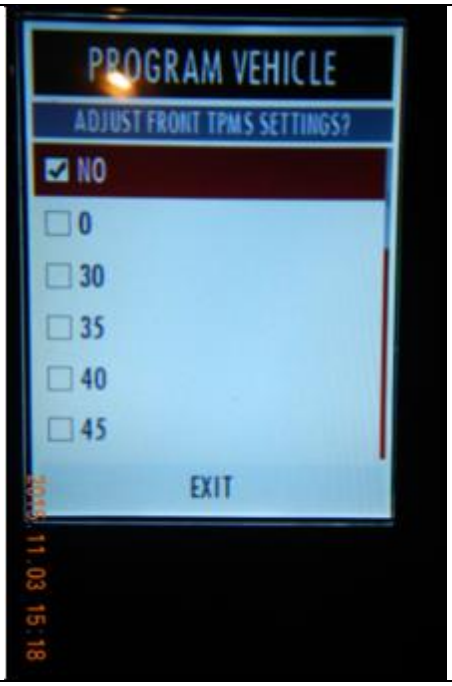
PHOTOGRAPH #: 52	
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 11/3/2015	
COMMENTS: Install option for fuel octane available with the SCT 7015 tuner on the F-150 test vehicle. ERG selected the 93 octane setting.	

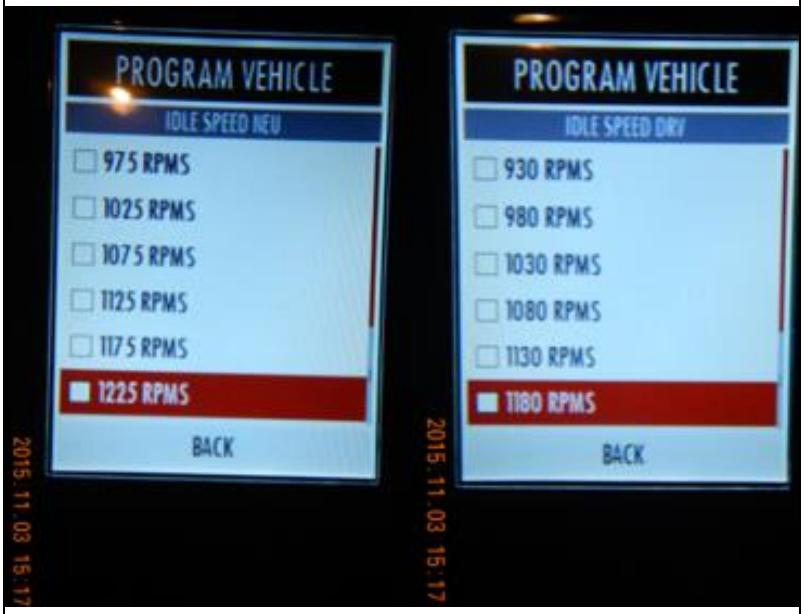
PHOTOGRAPH #: 53	
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 11/3/2015	
COMMENTS: Install option for the type of air intake available with the SCT 7015 tuner on the F-150 test vehicle.	

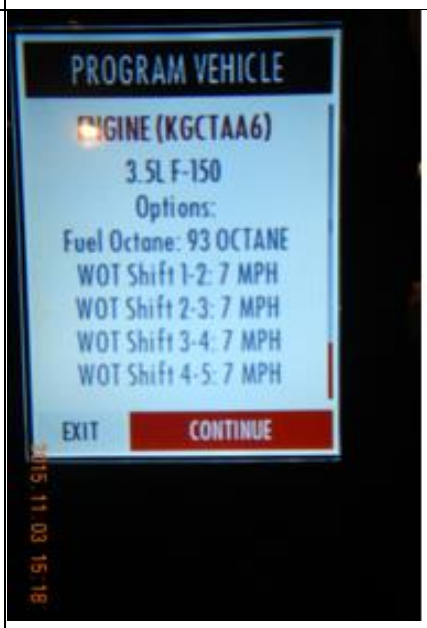
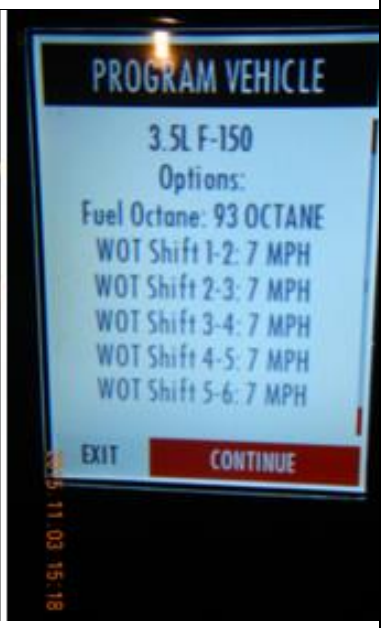
PHOTOGRAPH #: 54	
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 11/3/2015	
COMMENTS: Install option for global spark available with the SCT 7015 tuner on the F-150 test vehicle. Only negative numbers were available for the F-150, which represent retarding timing. For some vehicles this option also includes positive numbers, which would represent advancing timing. It was assumed that the 93 octane tune already advanced timing and this option allows you to retard it in the case knocking is observed.	

PHOTOGRAPH #: 55	
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 11/3/2015	
COMMENTS: Install option for wide open throttle (WOT) shift point from first gear into second gear for the SCT 7015 tuner on the F-150 test vehicle. The same option was available for gears 3 through 6.	

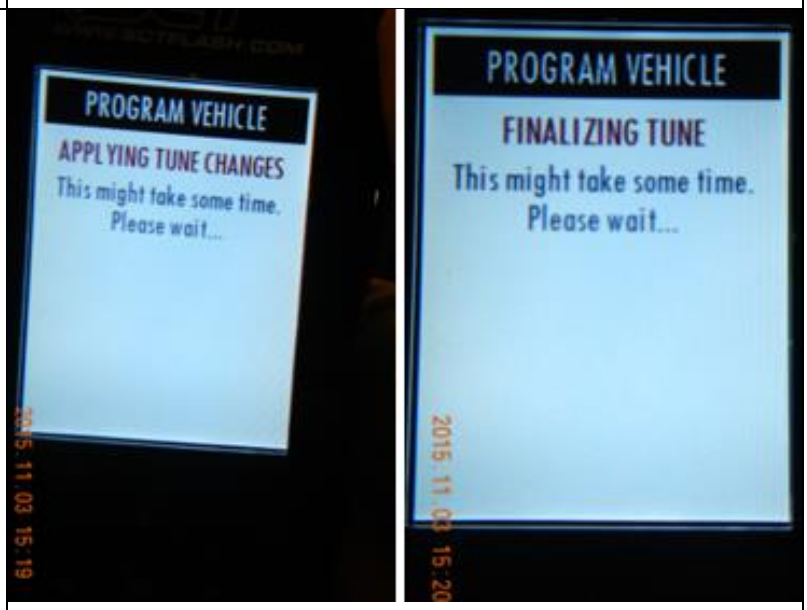
PHOTOGRAPH #: 56	
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 11/3/2015	
COMMENTS: Partial list of install option options for the SCT 7015 tuner on the F-150 test vehicle.	

PHOTOGRAPH #: 57	
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 11/3/2015	
COMMENTS: Adjust front tire pressure monitor system settings for the SCT 7015 tuner on the F-150 test vehicle. The same option appears for the rear tires as well.	

PHOTOGRAPH #: 58	
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 11/3/2015	
COMMENTS: Idle speed adjustment options for the SCT 7015 tuner on the F-150 test vehicle.	

PHOTOGRAPH #: 59	
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 11/3/2015	
COMMENTS: Overview of the tune installation options selected to install on the F-150 test vehicle.	 

PHOTOGRAPH #: 60	
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 11/3/2015	
COMMENTS: Screen shown after starting the installation process with the SCT 7015 tuner on the F-150 test vehicle indicating that the tuner saves the stock value.	

PHOTOGRAPH #: 61	
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 11/3/2015	
COMMENTS: Screen shown during the installation process with the SCT 7015 tuner on the F-150 test vehicle.	

PHOTOGRAPH #: 62	
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 11/3/2015	
COMMENTS: Screen shown during the installation process with the SCT 7015 tuner on the F-150 test vehicle indicating that the tuner copied the SCT preloaded tune to the vehicle.	

PHOTOGRAPH #: 63	
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 11/3/2015	
COMMENTS: Screen shown at the end of the initial installation process with the SCT 7015 tuner on the F-150 test vehicle. It was later determined that the vehicle battery voltage was too low to complete the installation, which is a safety net used by SCT. After hooking up to the battery with a charger, ERG was able to successfully repeat the installation process.	

PHOTOGRAPH #: 64	
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 11/3/2015	
COMMENTS: Installation confirmation screen on the SCT 7015 tuner after successfully installing the tuner on the F-150 test vehicle.	

PHOTOGRAPH #: 65	
TAKEN BY: B. Ruminski	**SITE LOCATION:** EPA NVFEL
DATE TAKEN: 11/3/2015	
COMMENTS: Device information screen on the SCT 7015 tuner immediately after successfully installing the tuner on the F-150 test vehicle.	

APPENDIX B
CHRONOLOGICAL ORDER OF PROCEDURES PERFORMED BY THE EPA AND ERG

Table 16. Chronological Order of Procedures Performed by the EPA and ERG

Day	Test Vehicle	Step
8/4/2015	N/A	ERG purchased a Bully Dog 40420 tuner (SN: 30V6S0F7L000T) directly from Punch-It Performance, LLC (Punch-It), a company the EPA and ERG inspected on 4 August 2015. ERG was unable to take possession of the tuner that day because Punch-It did not have one in stock. Instead, the unit was shipped directly to ERG from Bully Dog Acquisitions. It arrived at ERG's Chantilly, VA office on 11 August 2015.
8/4/2015	N/A	ERG purchased an SCT 7015 tuner (SN: X40717156ECA5) directly from Punch-It, a company the EPA and ERG inspected on 4 August 2015, and took possession of the tuner the same day.
10/23/2015	F-250	The F-250 test vehicle arrived at EPA's NVFEL.
10/26/2015	F-250	the EPA and ERG MSEB personnel (Brent Ruminski and Greg Orehowsky) traveled to Anne Arbor, MI and arrived at EPA's NVFEL.
		ERG obtained OBD data (i.e., Cal IDs, CVNs) from the F-250 test vehicle in the stock configuration.[a]
		The EPA NVFEL performed the derivation runs with the F-250 to determine the proper dynamometer set coefficients.
		The EPA NVFEL performed the prep with the F-250 for the baseline (i.e., stock) test.
10/27/2015	F-250	The EPA NVFEL initiated the baseline (i.e., stock) tests (FTP, HWFE, USO6, SC03) with the F-250. However, during the FTP test, a power conditioner in the lab failed thereby voiding the baseline FTP test.
		The EPA NVFEL performed the prep with the F-250 for the baseline (i.e., stock) test.
10/28/2015	F-250	The EPA NVFEL performed the baseline (i.e., stock) FTP, HWFE, USO6, and SC03 tests with the F-250.
		The EPA NVFEL determined that the incorrect manufacturer target coefficient was used during the derivation runs for the F-250 resulting in 2.30 to 4.24 percent less road load demanded by the dynamometer, depending on the road speed, than if the correct coefficient was used (see Appendix E). The decision was made to continue testing with the incorrect coefficient because less road load will not adversely affect emissions.
		ERG installed the Bully Dog 40420 tuner onto the F-250.
		ERG obtained OBD data (i.e., Cal IDs, CVNs) from the F-250 test vehicle after installing the Bully Dog 40420 tuner.
		The EPA NVFEL performed the prep with the F-250 for the Bully Dog 40420 tuner test. ERG set the on-the-fly tune setting to the Extreme level.
10/29/2015	F-250	The EPA NVFEL performed the FTP, HWFE, USO6, and SC03 tests with the Bully Dog 40420 tuner installed on the F-250.
		ERG returned the F-250 calibration to stock with the Bully Dog 40420 tuner.
		ERG obtained OBD data (i.e., Cal IDs, CVNs) from the F-250 test vehicle after returning to the stock configuration.
		ERG attempted to install the SCT 7015 tuner on the F-250 but the installation process was unsuccessful. ERG contacted SCT technical support directly to troubleshoot the error but a fix was never provided to ERG.
10/30/2015	F-150	The F-150 test vehicle arrived at EPA's NVFEL.
		ERG obtained the stock OBD data (i.e., Cal IDs, CVNs) from the F-150 test vehicle in the stock configuration.
		The EPA and ERG MSEB personnel (Brent Ruminski and Greg Orehowsky) departed the EPA NVFEL for the week.

Table 16. Chronological Order of Procedures Performed by the EPA and ERG

Day	Test Vehicle	Step
	F-250	ERG began analyzing the live engine data logged during the F-250 tests and determined that an active DPF regeneration occurred during the Bully Dog test but not during the baseline tests.
11/2/2015	F-150	ERG personnel (Brent Ruminski and Michael Sabisch) traveled to Anne Arbor, MI and arrived at EPA NVFEL.
		The EPA NVFEL performed the derivation runs with the F-150 test vehicle to determine the proper dynamometer coefficients.
		The EPA NVFEL performed the prep with the F-150 test vehicle for the baseline (i.e., stock) test.
	F-250	ERG reinstalled the Bully Dog 40420 tuner onto the F-250 because it was determined that a DPF regeneration occurred during the Bully Dog test on 29 October 2015 and was therefore not a valid test.
		ERG obtained OBD data (i.e., Cal IDs, CVNs) from the F-250 test vehicle after installing the Bully Dog 40420 tuner.
11/3/2015	F-150	The EPA NVFEL performed the baseline (i.e., stock) FTP, HWFE, USO6, and SC03 tests with the F-150 test vehicle.
		ERG installed the SCT 7015 tuner onto the F-150 test vehicle.
		ERG obtained OBD data (i.e., Cal IDs, CVNs) from the F-150 test vehicle after installing the Bully Dog 40420 tuner.
	F-250	The EPA NVFEL mounted the F-250 test vehicle to the dynamometer. With the assistance of the EPA NVFEL, ERG used the Bully Dog 40420 tuner to manually force a DPF regeneration on the F-250.
		The EPA NVFEL performed the prep with the F-250 for the Bully Dog 40420 tuner retest.
11/4/2015	F-150	The EPA NVFEL lost power during the morning hours.
		The EPA NVFEL attempted to perform the prep with the F-150 test vehicle for the SCT 7015 tuner test but the road speed fan malfunctioned.
11/5/2015	F-150	The road speed fan was repaired by late afternoon. The EPA NVFEL performed the prep with the F-150 test vehicle for the SCT 7015 tuner test.
11/6/2015	F-150	The EPA NVFEL performed the FTP, HWFE, USO6, and SC03 tests with the SCT 7015 tuner installed on the F-150 test vehicle.
		ERG returned the F-150 test vehicle calibration to stock with the SCT 7015 tuner.
		ERG obtained OBD data (i.e., Cal IDs, CVNs) from the F-150 test vehicle after returning to the stock configuration.
	F-250	ERG double checked OBD data (i.e., Cal IDs, CVNs) from the F-250 test vehicle with the Bully Dog 40420 tuner already installed to ensure that the on-the-fly setting was set to the Extreme level.
	N/A	ERG personnel (Brent Ruminski and Michael Sabisch) departed The EPA NVFEL for the week.
11/9/2015	F-250	The EPA NVFEL performed the prep with the F-250 for the Bully Dog 40420 tuner test.
11/10/2015	F-250	The EPA NVFEL performed the FTP, HWFE, USO6, and SC03 tests with the Bully Dog 40420 tuner installed on the F-250.

a – ERG generally obtained OBD data from the test vehicles at the beginning of each day even if a new calibration was not installed in order to verify that the ECM calibration was not tampered with. ERG recorded the Cal IDs and CVNs each time. Only the OBD data steps immediately before and after a calibration change are shown in this table.

APPENDIX C
MISCELLANEOUS EMAIL DOCUMENTATION

APPENDIX D RAW EMISSIONS TEST DATA FROM EPA NVEFEL

APPENDIX E
DYNAMOMETER COEFFICIENT DOCUMENTATION FROM EPA NVFEL

APPENDIX F
LIVE DATA ANALYSIS – F-25 TEST VEHICLE WITH THE BULLY DOG 40420 TUNER

APPENDIX G
LIVE DATA ANALYSIS – F-150 TEST VEHICLE WITH THE SCT 7015 TUNER

APPENDIX H
BULLY DOG TUNER – CUSTOMER COMPLAINTS REGARDING DPF REGENERATION

Brent Ruminski

From: Orehowsky, Gregory <Orehowsky.Gregory@epa.gov>
Sent: Friday, October 30, 2015 10:05 AM
To: Brent Ruminski
Subject: FW: Info on F150

Greg Orehowsky
U.Sbre. EPA
Office of Civil Enforcement
Air Enforcement Division
Phone 202-343-9292

From: [redacted]
Sent: Thursday, October 29, 2015 5:03 PM
To: Orehowsky, Gregory <Orehowsky.Gregory@epa.gov>
Subject: RE: Info on F150

Greg,

Engine family: DFMXT03.54DX
Calibration: [redacted]

[redacted]

From: Orehowsky, Gregory [mailto:Orehowsky.Gregory@epa.gov]
Sent: Thursday, October 29, 2015 4:39 PM
To: [redacted]
Subject: Info on F150

[redacted]

Truck is here. I didn't know all the places to look. Could we get the engine family for the vehicle and calibration id or part number.

Thanks

Greg Orehowsky
U.S. EPA
Office of Civil Enforcement
Air Enforcement Division
Phone 202-343-9292

Brent Ruminski

From: [redacted]
Sent: Tuesday, November 10, 2015 9:25 AM
To: Orehowsky, Gregory
Cc: Brent Ruminski
Subject: RE: Mileage on catalysts on diesel and gas vehicles

Greg,

They believe the diesel aftertreatment system age is the same as the odometer.

[redacted]

From: [redacted]
Sent: Friday, November 06, 2015 10:26 AM
To: 'Orehowsky, Gregory'
Cc: Brent Ruminski
Subject: RE: Mileage on catalysts on diesel and gas vehicles

Greg,

The gas vehicle catalyst is the mileage as indicated on the odometer.

The diesel vehicle catalyst has some mileage and is not 4K. The engineer of this vehicle is on vacation today and I can get the actual mileage on Monday.

How is the testing going?

[redacted]

From: Orehowsky, Gregory [mailto:Orehowsky.Gregory@epa.gov]
Sent: Friday, November 06, 2015 10:07 AM
To: [redacted]
Cc: Brent Ruminski
Subject: Re: Mileage on catalysts on diesel ang gas vehiles

[redacted]

Does the mileage on the two vehicles equal the mileage on the vehicles' catalysts?
Thanks

Greg

NVFEL Laboratory Test Data

CVS

Final Laboratory Test Results

Test Number: 2016-0026-006 Vehicle ID: FORD F250-184W121

Test Information

Test Date: 10/28/2015 MFR Name Ford Motor Company
Key Start / Hot Soak: 07:38:14 / 09:57 MFR Codes: FMX 30
Fuel Container ID / FTAG: F00023 / 25330 Config #: 00
Fuel Type: 19 Cert Diesel 7-15 ppm Sulfur Transmission: Auto
Test Procedure: 02 CVS 75-Later (w/o Can Load) (ftp3bag) Shift Schedule: A0EPA0005
FE Calculation Method: Diesel Beginning Odometer: 052832.0 MI
Pretest Remarks: Drive Schedule: ftp3bag
Drive Axle: AWD Soak Period: 20.8 hours

Bag Data	N2O	THC / IntTHC	CO	NOx	CO2	CH4	NMHC
Phase 1	(ppm)	(ppmC)	(ppm)	(ppm)	(%)	(ppm)	(ppmC)
Sample	0.906	12.074 / 12.684	40.468	4.120	0.971	3.894	
Ambient	0.329	2.236	0.223	0.012	0.045	2.051	
Net Concentration	0.600	10.001 / 10.611	40.261	4.109	0.929	1.993	8.469

Remarks:

Phase 2							
Sample	0.714	3.134 / 3.081	0.494	0.218	0.593	2.236	
Ambient	0.323	2.215	0.073	0.008	0.045	2.050	
Net Concentration	0.405	1.017 / 0.964	0.424	0.210	0.550	0.277	0.666

Remarks:

Phase 3							
Sample	1.001	4.064 / 4.154	15.218	1.139	0.806	2.594	
Ambient	0.324	2.202	0.024	0.006	0.045	2.057	
Net Concentration	0.696	1.994 / 2.084	15.195	1.133	0.763	0.660	1.374

Remarks:

Phase 4							
Sample							
Ambient							
Net Concentration							

Remarks: This test has particulate results.

Results	N2O	THC / IntTHC	CO	NOx	CO2	CH4	NMHC	Vol MPG
	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(mpg)
Phase 1	0.051	- / 0.282	2.160	0.328	783.5	0.061	0.225	12.958
Phase 2	0.054	- / 0.041	0.036	0.027	736.6	0.014	0.028	13.856
Phase 3	0.058	- / 0.055	0.806	0.090	636.5	0.020	0.036	16.001
							NMOG=NMHC	
Weighted	0.05454	0.09464	0.68894	0.10650	718.746	0.02523	0.07119	

Fuel Economy

	Diesel MPG
Phase 1	12.92
Phase 2	13.81
Phase 3	15.95
Weighted	14.13

Dyno Settings
Aug Brake
Y

AWD

Dyno #: D329 - AWD
Inertia: 9500
EPA Set Co A: -16.94
EPA Set Co B: -0.5339
EPA Set Co C: 0.04960
Emiss-Bench: Mexa 7200dle

NVFEL Laboratory Test Data

CVS

Final Laboratory Test Results

Test Number: 2016-0026-006 Vehicle ID: FORD F250-184W121

Results	N2O (grams)	THC / IntTHC (grams)	CO (grams)	NOx (grams)	CO2 (grams)	CH4 (grams)	NMHC (grams)	Meth Response 1.075
Phase 1	0.180	- / 1.005	7.699	1.170	2793.3	0.218	0.802	
Phase 2	0.208	- / 0.156	0.138	0.102	2816.5	0.052	0.108	
Phase 3	0.208	- / 0.196	2.885	0.320	2277.6	0.072	0.129	

Test Conditions	Phase 1	Phase 2	Phase 3	Phase 4
Barometer (inHg)	28.70	28.69	28.68	
Avg Cell Temp (degF)	74.05	74.01	74.03	
Dew Point (degF)	48.51	48.67	48.71	
Specific Humidity (grains/lbm)	52.78	53.13	53.24	
NOx Corr Factor	0.9054	0.9068	0.9072	
CO2 Dilution Factor	13.723	22.595	16.588	
CFV Vmix (scf @68F)	5777.83	9851.38	5736.51	
Total CVS Vmix (scf@68F)	5800.31	9889.54	5758.78	
CVS Flow Rate Avg (scfm)	683.36	678.47	678.21	
Fan Placement:	Road Speed Fan			
Phase Time (secs)	507.30	871.20	507.50	
Distance (miles)	3.565	3.824	3.578	
Bag Analysis Time (secs)	947.3	150.1	79.0	

	FTP B1	FTP B2	FTP B3	FTP-W	MFR
IWR % diff	-2.742	-1.973	-0.571	-1.752	-
ASCR % diff	-1.477	-0.929	-0.301	-0.883	-
EER	-0.636	-1.199	-0.574	-0.869	-

NVFEL Laboratory Test Data — PARTICULATE

Final Laboratory Test Results

Test Number: 2016-0026-006 — Vehicle ID: FORD F250-184W121

Test Information

Test Date:	10/28/2015	MFR Name	Ford Motor Company
Key Start:	07:38:14 / 09:57	MFR Codes:	FMX 30
Fuel Container ID:	F00023 / 25330	Config #:	00
Fuel Type:	19 Cert Diesel 7-15 ppm Sulfur	Transmission:	Auto
Test Procedure:	02 CVS 75-Later (w/o Can Load) (ftp3bag)	Shift Schedule:	A0EPA0005
Calculation Method:	Diesel	Beginning Odometer:	052832.0 MI
Pretest Remarks:		Drive Schedule:	ftp3bag
		Soak Period:	20.8 hours

All filter weights are corrected for buoyancy.

Particulate	Filter Sampler	Filter No.	Tare (Pre Wt)	Gross (Post Wt)	Net Wt mg	Total Mass mg	Total Mass mg / mi	Filter comment
Phase 1	A	220215117	363.1513	363.1522	0.00088	0.687	0.193	
	B	220215120	362.3767	362.3765	0.00000	0.000	0.000	
	C	220215123	360.5820	360.5829	0.00091	0.714	0.200	
Remarks:								
Phase 2	A	220215118	366.0701	366.0708	0.00064	0.498	0.130	
	B	220215121	368.6038	368.6037	0.00000	0.000	0.000	
	C	220215124	366.4137	366.4123	0.00000	0.000	0.000	
Remarks:								
Phase 3	A	220215119	365.8039	365.8004	0.00000	0.000	0.000	
	B	220215122	362.3384	362.3373	0.00000	0.000	0.000	
	C	220215125	364.2648	364.2656	0.00077	0.596	0.167	
Remarks:								
Phase 4								
Remarks:	This test has particulate results.							

Average Results

	Net Wt mg	Total Mass mg	Total Mass mg / mi
Phase 1	0.00060	0.700	0.196
Phase 2	0.00021	0.498	0.130
Phase 3	0.00026	0.596	0.167

All filter weights are corrected for buoyancy.

Weighted All Filters: 0.15403

Reference Filter Stability Check

2% of Avg Net or 0.01 mg	No.	Tare (Pre Wt)	Gross (Post Wt)	Net Wt mg	Stability Check PASS/FAIL
0.01	1	365.48782	365.48537	-0.00245	PASS
	2	365.77463	365.77298	-0.00165	PASS

PM Media
MTL PTFE_PFA

Dyno #: D329 - AWD
Inertia: 9500
EPA Set Co A: -16.94
EPA Set Co B: -0.5339
EPA Set Co C: 0.04960

Emissions Benc Mexa 7200dle

NVFEL Laboratory Test Data

PARTICULATE

Final Laboratory Test Results

Test Number: 2016-0026-006 Vehicle ID: FORD F250-184W121

WEIGHING CHAMBER	Timestamp	Buoyancy Factor	Operator (id)	Chamber Temp (°F)	Dew Point (°F)	Barometer ("Hg)	Last Change in Status Status @ timestamp
Pre-test	10/26/15 11:24	1.0003967	322990	71.6	49.6	29.48	NORM @ 10/26/15 08:33:35
Post-test	10/28/15 13:21	1.0003837	322990	71.3	49.4	28.50	NORM @ 10/28/15 09:58:32

Test Conditions	Phase 1	Phase 2	Phase 3	Phase 4
Barometer (inHg)	28.70	28.69	28.68	
Avg Cell Temp (degF)	74.05	74.01	74.03	
Dew Point (degF)	48.51	48.67	48.71	
Specific Humidity (grains/lbm)	52.78	53.13	53.24	
NOx Corr Factor	0.9054	0.9068	0.9072	
Dilution Factor	13.72	22.60	16.59	
CFV Vmix (scf @68F)	5777.83	9851.38	5736.51	
Sample Volume A (scf @68F)	7.434	12.752	7.339	
Sample Volume B (scf @68F)	7.616	12.694	7.538	
Sample Volume C (scf @68F)	7.423	12.719	7.393	
Sample Volume D (scf @68F)				
Sample Volume Average (scf @68F)	7.491	12.721	7.423	
Total PM Vmix (scf @68F)	5800.31	9889.54	5758.78	
Phase Time (sec)	507.30	871.20	507.50	
Distance (miles)	3.565	3.824	3.578	
PSU Probe A (degC)				
PSU Probe B (degC)				
PSU Probe C (degC)				
PSU Dil Air A (degC)	46.8	44.8	44.1	
PSU Dil Air B (degC)	42.1	39.5	40.4	
PSU Dil Air C (degC)	42.2	41.3	40.6	
PSU Filter A (degC)	45.9	46.0	47.4	
PSU Filter B (degC)	47.7	47.7	48.8	
PSU Filter C (degC)	48.7	48.6	47.9	
PSU Dil Flow A (lpm)	29.9	29.9	29.7	
PSU Dil Flow B (lpm)	29.9	29.9	29.7	
PSU Dil Flow C (lpm)	29.8	29.9	29.6	
PSU A Proportionality .				
PSU B Proportionality .				
PSU C Proportionality .				

NVFEL Laboratory Test Data

CVS

Final Laboratory Test Results

Test Number: 2016-0026-003 Vehicle ID: FORD F250-184W121

Test Information

Test Date:	10/28/2015	MFR Name	Ford Motor Company
Key Start:	09:02:38	MFR Codes:	FMX 30
Fuel Container ID / FTAG:	F00023 / 25330	Config #:	00
Fuel Type:	19 Cert Diesel 7-15 ppm Sulfur	Transmission:	Auto
Test Procedure:	3 HWFET (hwfetprep_hwfet)	Shift Schedule:	A0EPA0011
FE Calculation Method:	Diesel	Beginning Odometer:	052843.0 MI
Pretest Remarks:		Drive Schedule:	hwfetwarmup_hwfet
Drive Axle:	AWD		

Bag Data	N2O	THC / IntTHC	CO	NOx	CO2	CH4	NMHC
Phase 1	(ppm)	(ppmC)	(ppm)	(ppm)	(%)	(ppm)	(ppmC)
Sample	0.792	2.602 / 2.667	0.511	0.229	1.044	2.232	
Ambient	0.329	2.147	0.000	0.008	0.046	2.047	
Net Concentration	0.489	0.622 / 0.688	0.511	0.222	1.002	0.345	0.317

Remarks:

Phase 2

Sample
Ambient
Net Concentration

Remarks:

Phase 3

Sample
Ambient
Net Concentration

Remarks:

Phase 4

Sample
Ambient
Net Concentration

Remarks: This test has particulate results.

Results	N2O	THC / IntTHC	CO	NOx	CO2	CH4	NMHC	Vol MPG
	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(mpg)
Phase 1	0.021	- / 0.009	0.014	0.009	434.2	0.005	0.004	23.509

NMOG=NMHC

Fuel Economy

	Diesel MPG
Phase 1	23.43

Dyno Settings	
Aug Brake	Dyno #: D329 - AWD
Y	Inertia: 9500
	EPA Set Co A: -16.94
	EPA Set Co B: -0.5339
	EPA Set Co C: 0.04960
AWD	Emiss-Bench: Mexa 7200dle

NVFEL Laboratory Test Data

Final Laboratory Test Results

CVS

Test Number: 2016-0026-003 Vehicle ID: FORD F250-184W121

Results	N2O (grams)	THC / IntTHC (grams)	CO (grams)	NOx (grams)	CO2 (grams)	CH4 (grams)	NMHC (grams)	Meth Response
Phase 1	0.217	- / 0.096	0.144	0.093	4442.4	0.056	0.044	1.075

Test Conditions	Phase 1	Phase 2	Phase 3	Phase 4
Barometer (inHg)	28.64			
Avg Cell Temp (degF)	73.97			
Dew Point (degF)	48.78			
Specific Humidity (grains/lbm)	53.45			
NOx Corr Factor	0.9080			
CO2 Dilution Factor	12.826			
CFV Vmix (scf @68F)	8522.84			
Total CVS Vmix (scf@68F)	8556.51			
CVS Flow Rate Avg (scfm)	668.37			
Fan Placement:	Road Speed Fan			
Phase Time (secs)	765.10			
Distance (miles)	10.231			
Bag Analysis Time (secs)	57.3			

	HWY	MFR
IWR % diff	1.458	-
ASCR % diff	1.338	-
EER	-0.331	-

NVFEL Laboratory Test Data

PARTICULATE

Final Laboratory Test Results

Test Number: 2016-0026-003 Vehicle ID: FORD F250-184W121

Test Information

Test Date:	10/28/2015	MFR Name	Ford Motor Company
Key Start:	09:02:38	MFR Codes:	FMX 30
Fuel Container ID:	F00023 / 25330	Config #:	00
Fuel Type:	19 Cert Diesel 7-15 ppm Sulfur	Transmission:	Auto
Test Procedure:	3 HWFET (hwfetprep_hwfet)	Shift Schedule:	A0EPA0011
Calculation Method:	Diesel	Beginning Odometer:	052843.0 MI
Pretest Remarks:		Drive Schedule:	hwfetwarmup_hwfet

All filter weights are corrected for buoyancy.

Particulate	Filter Sampler	Filter No.	Tare (Pre Wt)	Gross (Post Wt)	Net Wt mg	Total Mass mg	Total Mass mg / mi	Filter comment
Phase 1	A	220215147	362.9483	362.9481	0.00000	0.000	0.000	
	B	220215148	361.8706	361.8736	0.00304	2.291	0.224	
	C	220215149	367.0179	367.0202	0.00228	1.748	0.171	

Remarks:

Phase 2

Remarks:

Phase 3

Remarks:

Phase 4

Remarks: This test has particulate results.

Average Results

	Net Wt mg	Total Mass mg	Total Mass mg / mi
Phase 1	0.00177	2.020	0.197

All filter weights are corrected for buoyancy

Reference Filter Stability Check

2% of Avg Net or 0.01 mg: 0.01

PM Media: MTL PTFE_PFA

No.	Tare (Pre Wt)	Gross (Post Wt)	Net Wt mg	Stability Check PASS/FAIL
1	365.48761	365.48530	-0.00231	PASS
2	365.77402	365.77281	-0.00121	PASS

Dyno #: D329 - AWD
Inertia: 9500
EPA Set Co A: -16.94
EPA Set Co B: -0.5339
EPA Set Co C: 0.04960

Emissions Bencl Mexa 7200dle

NVFEL Laboratory Test Data

PARTICULATE

Final Laboratory Test Results

Test Number: 2016-0026-003 Vehicle ID: FORD F250-184W121

WEIGHING CHAMBER	Timestamp	Buoyancy Factor	Operator (id)	Chamber Temp (°F)	Dew Point (°F)	Barometer ("Hg)	Last Change in Status Status @ timestamp
Pre-test	10/26/15 15:41	1.0003955	322990	72	49.4	29.42	NORM @ 10/26/15 08:33:35
Post-test	10/28/15 14:01	1.0003832	322990	71.7	49.4	28.49	NORM @ 10/28/15 09:58:32

Test Conditions	Phase 1	Phase 2	Phase 3	Phase 4
Barometer (inHg)	28.64			
Avg Cell Temp (degF)	73.97			
Dew Point (degF)	48.78			
Specific Humidity (grains/lbm)	53.45			
NOx Corr Factor	0.9080			
Dilution Factor	12.83			
CFV Vmix (scf @68F)	8522.84			
Sample Volume A (scf @68F)	11.168			
Sample Volume B (scf @68F)	11.354			
Sample Volume C (scf @68F)	11.143			
Sample Volume D (scf @68F)				
Sample Volume Average (scf @68F)	11.222			
Total PM Vmix (scf @68F)	8556.51			
Phase Time (sec)	765.10			
Distance (miles)	10.231			
PSU Probe A (degC)				
PSU Probe B (degC)				
PSU Probe C (degC)				
PSU Dil Air A (degC)	44.4			
PSU Dil Air B (degC)	39.8			
PSU Dil Air C (degC)	41.1			
PSU Filter A (degC)	47.5			
PSU Filter B (degC)	50.8			
PSU Filter C (degC)	50.1			
PSU Dil Flow A (lpm)	29.8			
PSU Dil Flow B (lpm)	29.8			
PSU Dil Flow C (lpm)	29.8			
PSU A Proportionality				
PSU B Proportionality				
PSU C Proportionality				

NVFEL Laboratory Test Data

CVS

Final Laboratory Test Results - NOTE: Variance from CFR procedures per OECA-OAR QAPP October 2015

Test Number: 2016-0026-005 Vehicle ID: FORD F250-184W121

Test Information

Test Date:	10/28/2015	MFR Name	Ford Motor Company
Key Start:	11:48:06	MFR Codes:	FMX 30
Fuel Container ID / FTAG:	F00023 / 25330	Config #:	00
Fuel Type:	19 Cert Diesel 7-15 ppm Sulfur	Transmission:	Auto
Test Procedure:	8.09 sc03wu_sc03	Shift Schedule:	A0EPA0005
FE Calculation Method:	Diesel	Beginning Odometer:	052879.0 MI
Pretest Remarks:		Drive Schedule:	sc03wu_sc03
Drive Axle:	AWD		

Bag Data	N2O	THC / IntTHC	CO	NOx	CO2	CH4	NMHC
Phase 1	(ppm)	(ppmC)	(ppm)	(ppm)	(%)	(ppm)	(ppmC)
Sample	0.837	2.541 / 2.482	0.412	7.017	0.785	2.036	
Ambient	0.323	2.177	0.000	0.022	0.044	2.025	
Net Concentration	0.533	0.492 / 0.433	0.412	6.997	0.743	0.129	0.294

Remarks: PSU B Proportionality took about 1000secs. to get on specs.

Phase 2

Sample
Ambient
Net Concentration

Remarks:

Phase 3

Sample
Ambient
Net Concentration

Remarks:

Phase 4

Sample
Ambient
Net Concentration

Remarks: This test has particulate results.

Results	N2O	THC / IntTHC	CO	NOx	CO2	CH4	NMHC	Vol MPG
	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(mpg)
Phase 1	0.052	- / 0.013	0.026	0.649	722.4	0.005	0.009	14.129

NMOG=NMHC

Fuel Economy	Diesel MPG
Phase 1	14.08

Dyno Settings	
Aug Brake	Dyno #: D329 - AWD
Y	Inertia: 9500
	EPA Set Co A: -16.94
	EPA Set Co B: -0.5339
	EPA Set Co C: 0.04960
AWD	Emiss-Bench: Mexa 7200dle

NVFEL Laboratory Test Data

CVS

Final Laboratory Test Results - NOTE: Variance from CFR procedures per OECA-OAR QAPP October 2015

Test Number: 2016-0026-005 Vehicle ID: FORD F250-184W121

Results	N2O (grams)	THC / IntTHC (grams)	CO (grams)	NOx (grams)	CO2 (grams)	CH4 (grams)	NMHC (grams)	Meth Response
Phase 1	0.186	- / 0.048	0.091	2.326	2589.3	0.016	0.032	1.075

Test Conditions	Phase 1	Phase 2	Phase 3	Phase 4
Barometer (inHg)	28.57			
Avg Cell Temp (degF)	73.87			
Dew Point (degF)	49.31			
Specific Humidity (grains/lbm)	54.65			
NOx Corr Factor	0.9127			
CO2 Dilution Factor	17.064			
CFV Vmix (scf @68F)	6699.55			
Total CVS Vmix (scf@68F)	6725.72			
CVS Flow Rate Avg (scfm)	674.45			
Fan Placement:	Road Speed Fan			
Phase Time (secs)	596.00			
Distance (miles)	3.584			
Bag Analysis Time (secs)	83.0			

	MFR
IWR % diff	-
ASCR % diff	-
EER	-

NVFEL Laboratory Test Data — PARTICULATE

Final Laboratory Test Results - NOTE: Variance from CFR procedures per OECA-OAR QAPP October 2015

Test Number: 2016-0026-005 — Vehicle ID: FORD F250-184W121

Test Information

Test Date:	10/28/2015	MFR Name	Ford Motor Company
Key Start:	11:48:06	MFR Codes:	FMX 30
Fuel Container ID:	F00023 / 25330	Config #:	00
Fuel Type:	19 Cert Diesel 7-15 ppm Sulfur	Transmission:	Auto
Test Procedure:	8.09 sc03wu_sc03	Shift Schedule:	A0EPA0005
Calculation Method:	Diesel	Beginning Odometer:	052879.0 MI
Pretest Remarks:		Drive Schedule:	sc03wu_sc03

All filter weights are corrected for buoyancy.

Particulate	Filter Sampler	Filter No.	Tare (Pre Wt)	Gross (Post Wt)	Net Wt mg	Total Mass mg	Total Mass mg / mi	Filter comment
Phase 1	A	220215129	367.4670	367.4700	0.00301	2.335	0.651	
	B	220215130	362.3705	362.3780	0.00747	5.701	1.591	
	C	220215131	366.6837	366.6855	0.00182	1.412	0.394	

Remarks: PSU B Proportionality took about 1000secs. to get on specs.

Phase 2

Remarks:

Phase 3

Remarks:

Phase 4

Remarks: This test has particulate results.

Average Results

	Net Wt mg	Total Mass mg	Total Mass mg / mi
Phase 1	0.00410	3.149	0.879

All filter weights are corrected for buoyancy.

Reference Filter Stability Check

2% of Avg Net or 0.01 mg: 0.01

PM Media: MTL PTFE_PFA

No.	Tare (Pre Wt)	Gross (Post Wt)	Net Wt mg	Stability Check PASS/FAIL
1	365.48783	365.48556	-0.00227	PASS
2	365.77394	365.77297	-0.00097	PASS

Dyno #: D329 - AWD
Inertia: 9500
EPA Set Co A: -16.94
EPA Set Co B: -0.5339
EPA Set Co C: 0.04960

Emissions Bencl Mexa 7200dle

NVFEL Laboratory Test Data

PARTICULATE

Final Laboratory Test Results - NOTE: Variance from CFR procedures per OECA-OAR QAPP October 2015

Test Number: 2016-0026-005 Vehicle ID: FORD F250-184W121

WEIGHING CHAMBER	Timestamp	Buoyancy Factor	Operator (id)	Chamber Temp (°F)	Dew Point (°F)	Barometer ("Hg)	Last Change in Status Status @ timestamp
Pre-test	10/26/15 11:49	1.0003967	322990	71.5	49.4	29.48	NORM @ 10/26/15 08:33:35
Post-test	10/29/15 9:39	1.0003850	322990	71.2	49.7	28.60	NORM @ 10/28/15 09:58:32

Test Conditions	Phase 1	Phase 2	Phase 3	Phase 4
Barometer (inHg)	28.57			
Avg Cell Temp (degF)	73.87			
Dew Point (degF)	49.31			
Specific Humidity (grains/lbm)	54.65			
NOx Corr Factor	0.9127			
Dilution Factor	17.06			
CFV Vmix (scf @68F)	6699.55			
Sample Volume A (scf @68F)	8.680			
Sample Volume B (scf @68F)	8.818			
Sample Volume C (scf @68F)	8.680			
Sample Volume D (scf @68F)				
Sample Volume Average (scf @68F)	8.726			
Total PM Vmix (scf @68F)	6725.72			
Phase Time (sec)	596.00			
Distance (miles)	3.584			
PSU Probe A (degC)				
PSU Probe B (degC)				
PSU Probe C (degC)				
PSU Dil Air A (degC)	43.5			
PSU Dil Air B (degC)	39.3			
PSU Dil Air C (degC)	40.2			
PSU Filter A (degC)	45.5			
PSU Filter B (degC)	47.5			
PSU Filter C (degC)	48.3			
PSU Dil Flow A (lpm)	29.7			
PSU Dil Flow B (lpm)	29.7			
PSU Dil Flow C (lpm)	29.6			
PSU A Proportionality				
PSU B Proportionality				
PSU C Proportionality				

NVFEL Laboratory Test Data

CVS

Final Laboratory Test Results

Test Number: 2016-0026-004 | Vehicle ID: FORD F250-184W121

Test Information

Test Date:	10/28/2015	MFR Name	Ford Motor Company
Key Start:	10:34:37	MFR Codes:	FMX 30
Fuel Container ID / FTAG:	F00023 / 25330	Config #:	00
Fuel Type:	19 Cert Diesel 7-15 ppm Sulfur	Transmission:	Auto
Test Procedure:	89 us062bag (us06warmup_2bagus06)	Shift Schedule:	A0EPA0041
FE Calculation Method:	Diesel	Beginning Odometer:	052863.0 MI
Pretest Remarks:		Drive Schedule:	us06warmup_2bagus06
Drive Axle:	AWD		

Bag Data	N2O	THC / IntTHC	CO	NOx	CO2	CH4	NMHC
Phase 1	(ppm)	(ppmC)	(ppm)	(ppm)	(%)	(ppm)	(ppmC)
Sample	1.441	2.197 / 2.249	0.871	17.202	1.721	1.757	
Ambient	0.343	2.150	0.036	0.538	0.071	2.009	
Net Concentration	1.142	0.323 / 0.375	0.839	16.734	1.660	0.006	0.368

Remarks: PSU Proportionality outside of CFR specifications - Variant Test

Phase 2							
Sample	1.182	2.200 / 2.204	0.884	6.493	1.886	1.922	
Ambient	0.331	2.173	0.033	0.093	0.052	2.017	
Net Concentration	0.897	0.333 / 0.337	0.856	6.413	1.841	0.189	0.133

Remarks:

Phase 3							
Sample							
Ambient							
Net Concentration							

Remarks:

Phase 4							
Sample							
Ambient							
Net Concentration							

Remarks: This test has particulate results.

Results	N2O	THC / IntTHC	CO	NOx	CO2	CH4	NMHC	Vol MPG
	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(mpg)
Phase 1	0.086	- / 0.009	0.040	1.204	1255.3	0.000	0.009	8.132
Phase 2	0.029	- / 0.003	0.018	0.199	601.4	0.002	0.001	16.973
Composite	0.04191	0.00468	0.02278	0.42121	745.878	0.00180	NMOG=NMHC 0.00301	

Fuel Economy	Diesel MPG
Phase 1	8.11
Phase 2	16.92
Composite	13.64

Dyno Settings	
Aug Brake	Y
	AWD

Dyno #: D329 - AWD
Inertia: 9500
EPA Set Co A: -16.94
EPA Set Co B: -0.5339
EPA Set Co C: 0.04960
Emiss-Bench: Mexa 7200dle

NVFEL Laboratory Test Data

CVS

Final Laboratory Test Results

Test Number: 2016-0026-004 Vehicle ID: FORD F250-184W121

Results	N2O (grams)	THC / IntTHC (grams)	CO (grams)	NOx (grams)	CO2 (grams)	CH4 (grams)	NMHC (grams)	Meth Response 1.075
Phase 1	0.153	- / 0.016	0.071	2.129	2219.7	0.000	0.016	
Phase 2	0.183	- / 0.022	0.111	1.243	3750.6	0.014	0.009	

Test Conditions	Phase 1	Phase 2	Phase 3	Phase 4
Barometer (inHg)	28.61	28.61		
Avg Cell Temp (degF)	74.12	74.02		
Dew Point (degF)	48.96	49.03		
Specific Humidity (grains/lbm)	53.88	54.03		
NOx Corr Factor	0.9097	0.9103		
CO2 Dilution Factor	7.784	7.103		
CFV Vmix (scf @68F)	2571.51	3916.40		
Total CVS Vmix (scf@68F)	2581.50	3931.54		
CVS Flow Rate Avg (scfm)	649.10	643.79		
Fan Placement:	Road Speed Fan			
Phase Time (secs)	130.00	365.00	107.70	
Distance (miles)	1.768	6.236		
Bag Analysis Time (secs)	57.5	239.2		

	US06-C	US06-H	US06-T	MFR
IWR % diff	0.808	-11.242	-5.055	-
ASCR % diff	0.689	-8.587	-2.249	-
EER	0.894	-0.936	-0.373	-

NVFEL Laboratory Test Data

PARTICULATE

Final Laboratory Test Results

Test Number: 2016-0026-004 | Vehicle ID: FORD F250-184W121

Test Information

Test Date:	10/28/2015	MFR Name	Ford Motor Company
Key Start:	10:34:37	MFR Codes:	FMX 30
Fuel Container ID:	F00023 / 25330	Config #:	00
Fuel Type:	19 Cert Diesel 7-15 ppm Sulfur	Transmission:	Auto
Test Procedure:	89 us062bag (us06warmup_2bagus06)	Shift Schedule:	A0EPA0041
Calculation Method:	Diesel	Beginning Odometer:	052863.0 MI
Pretest Remarks:		Drive Schedule:	us06warmup_2bagus06

All filter weights are corrected for buoyancy

Particulate	Filter Sampler	Filter No.	Tare (Pre Wt)	Gross (Post Wt)	Net Wt mg	Total Mass mg	Total Mass mg / mi	Filter comment
Phase 1	A	220215126	362.9477	362.9513	0.00354	2.923	0.365	
	B	220215127	365.7792	365.7836	0.00431	3.228	0.403	
	C	220215128	362.5770	362.5856	0.00865	6.579	0.822	

Remarks: PSU Proportionality outside of CFR specifications - Variant Test

Phase 2

Remarks:

Phase 3

Remarks:

Phase 4

Remarks: This test has particulate results

Average Results

	Net Wt mg	Total Mass mg	Total Mass mg / mi
Phase 1	0.00550	4.243	0.530

All filter weights are corrected for buoyancy

Reference Filter Stability Check

2% of Avg Net or 0.01 mg: 0.01

PM Media: MTL PTFE_PFA

No.	Tare (Pre Wt)	Gross (Post Wt)	Net Wt mg	Stability Check PASS/FAIL
1	365.48783	365.48494	-0.00289	PASS
2	365.77394	365.77265	-0.00129	PASS

Dyno #: D329 - AWD
Inertia: 9500
EPA Set Co A: -16.94
EPA Set Co B: -0.5339
EPA Set Co C: 0.04960

Emissions Bench: Mexa 7200dle

NVFEL Laboratory Test Data

PARTICULATE

Final Laboratory Test Results

Test Number: 2016-0026-004 Vehicle ID: FORD F250-184W121

WEIGHING CHAMBER	Timestamp	Buoyancy Factor	Operator (id)	Chamber Temp (°F)	Dew Point (°F)	Barometer ("Hg)	Last Change in Status Status @ timestamp
Pre-test	10/26/15 11:49	1.0003967	322990	71.5	49.4	29.48	NORM @ 10/26/15 08:33:35
Post-test	10/29/15 9:20	1.0003847	322990	71.6	49.5	28.60	NORM @ 10/28/15 09:58:32

Test Conditions	Phase 1	Phase 2	Phase 3	Phase 4
Barometer (inHg)	28.61	28.61		
Avg Cell Temp (degF)	74.12	74.02		
Dew Point (degF)	48.96	49.03		
Specific Humidity (grains/lbm)	53.88	54.03		
NOx Corr Factor	0.9097	0.9103		
Dilution Factor	7.78	7.10		
CFV Vmix (scf @68F)	2571.51	3916.40		
Sample Volume A (scf @68F)	7.892	4.820		
Sample Volume B (scf @68F)	8.692	5.164		
Sample Volume C (scf @68F)	8.561	5.164		
Sample Volume D (scf @68F)				
Sample Volume Average (scf @68F)	8.382	5.049		
Total PM Vmix (scf @68F)	2581.50	3931.54		
Phase Time (sec)	130.00	365.00	107.70	
Distance (miles)	1.768	6.236		
PSU Probe A (degC)				
PSU Probe B (degC)				
PSU Probe C (degC)				
PSU Dil Air A (degC)	44.7	44.5		
PSU Dil Air B (degC)	40.0	39.9		
PSU Dil Air C (degC)	41.2	41.1		
PSU Filter A (degC)	47.6	47.6		
PSU Filter B (degC)	48.4	48.3		
PSU Filter C (degC)	49.0	48.8		
PSU Dil Flow A (lpm)	29.2	28.9		
PSU Dil Flow B (lpm)	29.2	28.9		
PSU Dil Flow C (lpm)	29.1	28.9		
PSU A Proportionality				
PSU B Proportionality				
PSU C Proportionality				

NVFEL Laboratory Test Data

CVS

Final Laboratory Test Results

Test Number: 2016-0026-008 Vehicle ID: FORD F250-184W121

Test Information

Test Date:	10/29/2015	MFR Name	Ford Motor Company
Key Start / Hot Soak:	07:23:24 / 09:51	MFR Codes:	FMX 30
Fuel Container ID / FTAG:	F00023 / 25330	Config #:	00
Fuel Type:	19 Cert Diesel 7-15 ppm Sulfur	Transmission:	Auto
Test Procedure:	02 CVS 75-Later (w/o Can Load) (ftp3bag)	Shift Schedule:	A0EPA0005
FE Calculation Method:	Diesel	Beginning Odometer:	052895.0 MI
Pretest Remarks:		Drive Schedule:	ftp3bag
Drive Axle:	AWD	Soak Period:	14.0 hours

Bag Data	N2O	THC / IntTHC	CO	NOx	CO2	CH4	NMHC
Phase 1	(ppm)	(ppmC)	(ppm)	(ppm)	(%)	(ppm)	(ppmC)
Sample	0.736	14.884 / 15.330	71.656	4.829	0.899	4.437	
Ambient	0.320	2.254	0.329	0.019	0.046	2.036	
Net Concentration	0.438	12.783 / 13.229	71.350	4.811	0.857	2.539	10.499

Remarks: Regen during 3 phase

Phase 2							
Sample	0.667	2.917 / 2.776	0.530	0.849	0.565	2.180	
Ambient	0.319	2.234	0.079	0.014	0.046	2.005	
Net Concentration	0.362	0.777 / 0.636	0.454	0.835	0.521	0.260	0.357

Remarks:

Phase 3							
Sample	2.459	8.149 / 8.568	17.076	4.609	0.949	5.462	
Ambient	0.322	2.213	0.100	0.022	0.046	2.005	
Net Concentration	2.160	6.093 / 6.512	16.984	4.588	0.906	3.599	2.643

Remarks:

Phase 4							
Sample							
Ambient							
Net Concentration							

Remarks: This test has particulate results.

Results	N2O	THC / IntTHC	CO	NOx	CO2	CH4	NMHC	Vol MPG
	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(mpg)
Phase 1	0.038	- / 0.366	3.986	0.396	752.0	0.081	0.291	13.443
Phase 2	0.051	- / 0.028	0.040	0.109	727.6	0.013	0.016	14.028
Phase 3	0.188	- / 0.178	0.939	0.373	786.6	0.114	0.072	12.945
							NMOG=NMHC	
Weighted	0.08577	0.13950	1.10631	0.24143	748.889	0.05508	0.08831	

Fuel Economy	Diesel MPG
Phase 1	13.40
Phase 2	13.98
Phase 3	12.90
Weighted	13.55

Dyno Settings	
Aug Brake	Dyno #: D329 - AWD
Y	Inertia: 9500
	EPA Set Co A: -16.94
	EPA Set Co B: -0.5339
	EPA Set Co C: 0.04960
AWD	Emiss-Bench: Mexa 7200dle

NVFEL Laboratory Test Data

Final Laboratory Test Results

CVS

Test Number: 2016-0026-008 Vehicle ID: FORD F250-184W121

Results	N2O (grams)	THC / IntTHC (grams)	CO (grams)	NOx (grams)	CO2 (grams)	CH4 (grams)	NMHC (grams)	Meth Response 1.075
Phase 1	0.137	- / 1.306	14.225	1.413	2683.5	0.290	1.037	
Phase 2	0.193	- / 0.107	0.154	0.418	2785.3	0.051	0.060	
Phase 3	0.671	- / 0.638	3.359	1.336	2814.6	0.408	0.259	

Test Conditions	Phase 1	Phase 2	Phase 3	Phase 4
Barometer (inHg)	28.59	28.59	28.59	
Avg Cell Temp (degF)	74.06	73.99	74.05	
Dew Point (degF)	47.17	47.27	47.24	
Specific Humidity (grains/lbm)	50.36	50.55	50.50	
NOx Corr Factor	0.8962	0.8969	0.8967	
CO2 Dilution Factor	14.758	23.694	14.088	
CFV Vmix (scf @68F)	6024.68	10271.27	5975.95	
Total CVS Vmix (scf@68F)	6047.02	10309.44	5998.26	
CVS Flow Rate Avg (scfm)	712.56	707.63	706.93	
Fan Placement:	Road Speed Fan			
Phase Time (secs)	507.30	870.90	507.20	
Distance (miles)	3.569	3.828	3.578	
Bag Analysis Time (secs)	960.3	164.4	156.1	

	FTP B1	FTP B2	FTP B3	FTP-W	MFR
IWR % diff	-1.861	-0.537	-1.994	-1.198	-
ASCR % diff	-1.121	-0.372	-1.280	-0.687	-
EER	-0.543	-0.513	-0.490	-0.500	-

NVFEL Laboratory Test Data

PARTICULATE

Final Laboratory Test Results

Test Number: 2016-0026-008 | Vehicle ID: FORD F250-184W121

Test Information

Test Date:	10/29/2015	MFR Name	Ford Motor Company
Key Start:	07:23:24 / 09:51	MFR Codes:	FMX 30
Fuel Container ID:	F00023 / 25330	Config #:	00
Fuel Type:	19 Cert Diesel 7-15 ppm Sulfur	Transmission:	Auto
Test Procedure:	02 CVS 75-Later (w/o Can Load) (ftp3bag)	Shift Schedule:	A0EPA0005
Calculation Method:	Diesel	Beginning Odometer:	052895.0 MI
Pretest Remarks:		Drive Schedule:	ftp3bag
		Soak Period:	14.0 hours

All filter weights are corrected for buoyancy

Particulate	Filter Sampler	Filter No.	Tare (Pre Wt)	Gross (Post Wt)	Net Wt mg	Total Mass mg	Total Mass mg / mi	Filter comment
Phase 1	A	220215229	367.3839	367.3838	0.00000	0.000	0.000	
	B	220215232	359.0205	359.0212	0.00080	0.634	0.178	
	C	220215235	361.2781	361.2786	0.00050	0.408	0.114	
Remarks:	Regen during 3 phase							
Phase 2	A	220215230	363.7903	363.7921	0.00181	1.456	0.380	
	B	220215233	365.8989	365.8989	0.00001	0.009	0.002	
	C	220215236	364.1125	364.1132	0.00071	0.579	0.151	
Remarks:								
Phase 3	A	220215231	359.4794	359.4796	0.00020	0.160	0.045	
	B	220215234	366.4285	366.4290	0.00051	0.409	0.114	
	C	220215237	360.8515	360.8521	0.00060	0.486	0.136	
Remarks:								
Phase 4								
Remarks:	This test has particulate results.							

Average Results	Net Wt mg	Total Mass mg	Total Mass mg / mi
Phase 1	0.00043	0.521	0.146
Phase 2	0.00084	0.681	0.178
Phase 3	0.00044	0.352	0.098

All filter weights are corrected for buoyancy

Weighted All Filters: 0.14944

Reference Filter Stability Check	No.	Tare (Pre Wt)	Gross (Post Wt)	Net Wt mg	Stability Check PASS/FAIL
2% of Avg Net or 0.01 mg					
0.01	1	365.48523	365.48524	0.00001	PASS
	2	365.77244	365.77305	0.00061	PASS

PM Media
MTL PTFE_PFA

Dyno #: D329 - AWD
Inertia: 9500
EPA Set Co A: -16.94
EPA Set Co B: -0.5339
EPA Set Co C: 0.04960

Emissions Bencl Mexa 7200dle

NVFEL Laboratory Test Data

PARTICULATE

Final Laboratory Test Results

Test Number: 2016-0026-008 Vehicle ID: FORD F250-184W121

WEIGHING CHAMBER	Timestamp	Buoyancy Factor	Operator (id)	Chamber Temp (°F)	Dew Point (°F)	Barometer ("Hg)	Last Change in Status Status @ timestamp
Pre-test	10/28/15 14:19	1.0003830	322990	71.8	49.7	28.48	NORM @ 10/28/15 09:58:32
Post-test	10/29/15 11:19	1.0003852	322990	71.4	49.5	28.63	NORM @ 10/28/15 09:58:32

Test Conditions	Phase 1	Phase 2	Phase 3	Phase 4
Barometer (inHg)	28.59	28.59	28.59	
Avg Cell Temp (degF)	74.06	73.99	74.05	
Dew Point (degF)	47.17	47.27	47.24	
Specific Humidity (grains/lbm)	50.36	50.55	50.50	
NOx Corr Factor	0.8962	0.8969	0.8967	
Dilution Factor	14.76	23.69	14.09	
CFV Vmix (scf @68F)	6024.68	10271.27	5975.95	
Sample Volume A (scf @68F)	7.308	12.801	7.387	
Sample Volume B (scf @68F)	7.593	12.773	7.515	
Sample Volume C (scf @68F)	7.436	12.598	7.413	
Sample Volume D (scf @68F)				
Sample Volume Average (scf @68F)	7.446	12.724	7.438	
Total PM Vmix (scf @68F)	6047.02	10309.44	5998.26	
Phase Time (sec)	507.30	870.90	507.20	
Distance (miles)	3.569	3.828	3.578	
PSU Probe A (degC)				
PSU Probe B (degC)				
PSU Probe C (degC)				
PSU Dil Air A (degC)	47.9	44.4	44.3	
PSU Dil Air B (degC)	41.4	39.4	40.7	
PSU Dil Air C (degC)	42.6	40.8	40.6	
PSU Filter A (degC)	45.8	46.0	47.4	
PSU Filter B (degC)	47.7	47.7	48.8	
PSU Filter C (degC)	48.5	48.5	47.9	
PSU Dil Flow A (lpm)	29.9	29.9	29.7	
PSU Dil Flow B (lpm)	29.9	29.9	29.7	
PSU Dil Flow C (lpm)	29.9	29.9	29.7	
PSU A Proportionality				
PSU B Proportionality				
PSU C Proportionality				

NVFEL Laboratory Test Data

CVS

Final Laboratory Test Results

Test Number: 2016-0026-009 Vehicle ID: FORD F250-184W121

Test Information

Test Date:	10/29/2015	MFR Name	Ford Motor Company
Key Start:	08:52:00	MFR Codes:	FMX 30
Fuel Container ID / FTAG:	F00023 / 25330	Config #:	00
Fuel Type:	19 Cert Diesel 7-15 ppm Sulfur	Transmission:	Auto
Test Procedure:	3 HWFET (hwfetprep_hwfet)	Shift Schedule:	A0EPA0011
FE Calculation Method:	Diesel	Beginning Odometer:	052906.0 MI
Pretest Remarks:		Drive Schedule:	hwfetwarmup_hwfet
Drive Axle:	AWD		

Bag Data	N2O	THC / IntTHC	CO	NOx	CO2	CH4	NMHC
Phase 1	(ppm)	(ppmC)	(ppm)	(ppm)	(%)	(ppm)	(ppmC)
Sample	0.862	2.197 / 2.203	0.546	1.017	1.087	2.171	
Ambient	0.322	2.034	0.000	0.026	0.047	2.000	
Net Concentration	0.566	0.328 / 0.334	0.546	0.994	1.044	0.333	-0.024

Remarks:

Phase 2

Sample
Ambient
Net Concentration

Remarks:

Phase 3

Sample
Ambient
Net Concentration

Remarks:

Phase 4

Sample
Ambient
Net Concentration

Remarks: This test has particulate results.

Results	N2O	THC / IntTHC	CO	NOx	CO2	CH4	NMHC	Vol MPG
	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(mpg)
Phase 1	0.024	- / 0.004	0.015	0.039	441.7	0.005	0.000	23.109

NMOG=NMHC

Fuel Economy	Diesel MPG
Phase 1	23.03

Dyno Settings	
Aug Brake	Dyno #: D329 - AWD
Y	Inertia: 9500
	EPA Set Co A: -16.94
	EPA Set Co B: -0.5339
	EPA Set Co C: 0.04960
AWD	Emiss-Bench: Mexa 7200dle

NVFEL Laboratory Test Data

Final Laboratory Test Results

CVS

Test Number: 2016-0026-009 Vehicle ID: FORD F250-184W121

Results	N2O (grams)	THC / IntTHC (grams)	CO (grams)	NOx (grams)	CO2 (grams)	CH4 (grams)	NMHC (grams)	Meth Response
Phase 1	0.245	- / 0.046	0.150	0.404	4523.3	0.053	0.000	1.075

Test Conditions	Phase 1	Phase 2	Phase 3	Phase 4
Barometer (inHg)	28.61			
Avg Cell Temp (degF)	73.92			
Dew Point (degF)	47.43			
Specific Humidity (grains/lbm)	50.83			
NOx Corr Factor	0.8980			
CO2 Dilution Factor	12.325			
CFV Vmix (scf @68F)	8332.14			
Total CVS Vmix (scf@68F)	8366.01			
CVS Flow Rate Avg (scfm)	653.42			
Fan Placement:	Road Speed Fan			
Phase Time (secs)	765.10			
Distance (miles)	10.240			
Bag Analysis Time (secs)	57.5			

	HWY	MFR
IWR % diff	-2.376	-
ASCR % diff	-2.058	-
EER	-0.475	-

NVFEL Laboratory Test Data

PARTICULATE

Final Laboratory Test Results

Test Number: 2016-0026-009 — Vehicle ID: FORD F250-184W121

Test Information

Test Date:	10/29/2015	MFR Name	Ford Motor Company
Key Start:	08:52:00	MFR Codes:	FMX 30
Fuel Container ID:	F00023 / 25330	Config #:	00
Fuel Type:	19 Cert Diesel 7-15 ppm Sulfur	Transmission:	Auto
Test Procedure:	3 HWFET (hwfetprep_hwfet)	Shift Schedule:	A0EPA0011
Calculation Method:	Diesel	Beginning Odometer:	052906.0 MI
Pretest Remarks:		Drive Schedule:	hwfetwarmup_hwfet

All filter weights are corrected for buoyancy.

Particulate	Filter Sampler	Filter No.	Tare (Pre Wt)	Gross (Post Wt)	Net Wt mg	Total Mass mg	Total Mass mg / mi	Filter comment
Phase 1	A	220215247	369.3982	369.4010	0.00281	2.086	0.204	
	B	220215248	359.2033	359.2029	0.00000	0.000	0.000	
	C	220215249	365.9509	365.9513	0.00040	0.299	0.029	

Remarks:

Phase 2

Remarks:

Phase 3

Remarks:

Phase 4

Remarks: This test has particulate results.

Average Results

	Net Wt mg	Total Mass mg	Total Mass mg / mi
Phase 1	0.00107	1.193	0.116

All filter weights are corrected for buoyancy.

Reference Filter Stability Check

2% of Avg Net or 0.01 mg: 0.01

PM Media: MTL PTFE_PFA

No.	Tare (Pre Wt)	Gross (Post Wt)	Net Wt mg	Stability Check PASS/FAIL
1	365.48542	365.48552	0.00010	PASS
2	365.77353	365.77293	-0.00060	PASS

Dyno #: D329 - AWD
Inertia: 9500
EPA Set Co A: -16.94
EPA Set Co B: -0.5339
EPA Set Co C: 0.04960

Emissions Benc Mexa 7200dle

NVFEL Laboratory Test Data

PARTICULATE

Final Laboratory Test Results

Test Number: 2016-0026-009 Vehicle ID: FORD F250-184W121

WEIGHING CHAMBER	Timestamp	Buoyancy Factor	Operator (id)	Chamber Temp (°F)	Dew Point (°F)	Barometer ("Hg)	Last Change in Status Status @ timestamp
Pre-test	10/28/15 15:25	1.0003827	322990	71.9	49.6	28.47	NORM @ 10/28/15 09:58:32
Post-test	10/29/15 11:02	1.0003852	322990	71.5	49.4	28.63	NORM @ 10/28/15 09:58:32

Test Conditions	Phase 1	Phase 2	Phase 3	Phase 4
Barometer (inHg)	28.61			
Avg Cell Temp (degF)	73.92			
Dew Point (degF)	47.43			
Specific Humidity (grains/lbm)	50.83			
NOx Corr Factor	0.8980			
Dilution Factor	12.33			
CFV Vmix (scf @68F)	8332.14			
Sample Volume A (scf @68F)	11.281			
Sample Volume B (scf @68F)	11.304			
Sample Volume C (scf @68F)	11.277			
Sample Volume D (scf @68F)				
Sample Volume Average (scf @68F)	11.288			
Total PM Vmix (scf @68F)	8366.01			
Phase Time (sec)	765.10			
Distance (miles)	10.240			
PSU Probe A (degC)				
PSU Probe B (degC)				
PSU Probe C (degC)				
PSU Dil Air A (degC)	45.1			
PSU Dil Air B (degC)	40.4			
PSU Dil Air C (degC)	41.7			
PSU Filter A (degC)	48.4			
PSU Filter B (degC)	50.8			
PSU Filter C (degC)	50.5			
PSU Dil Flow A (lpm)	30.2			
PSU Dil Flow B (lpm)	30.2			
PSU Dil Flow C (lpm)	30.1			
PSU A Proportionality				
PSU B Proportionality				
PSU C Proportionality				

NVFEL Laboratory Test Data

CVS

Final Laboratory Test Results - NOTE: Variance from CFR procedures per OECA-OAR QAPP October 2015

Test Number: 2016-0026-011 Vehicle ID: FORD F250-184W121

Test Information

Test Date:	10/29/2015	MFR Name	Ford Motor Company
Key Start:	11:10:03	MFR Codes:	FMX 30
Fuel Container ID / FTAG:	F00023 / 25330	Config #:	00
Fuel Type:	19 Cert Diesel 7-15 ppm Sulfur	Transmission:	Auto
Test Procedure:	8.09 sc03wu_sc03	Shift Schedule:	A0EPA0005
FE Calculation Method:	Diesel	Beginning Odometer:	052940.0 MI
Pretest Remarks:		Drive Schedule:	sc03wu_sc03
Drive Axle:	AWD		

Bag Data	N2O	THC / IntTHC	CO	NOx	CO2	CH4	NMHC
Phase 1	(ppm)	(ppmC)	(ppm)	(ppm)	(%)	(ppm)	(ppmC)
Sample	1.007	2.285 / 2.249	0.520	7.590	0.764	2.028	
Ambient	0.323	2.118	0.000	0.028	0.045	2.001	
Net Concentration	0.703	0.288 / 0.252	0.520	7.564	0.722	0.141	0.100

Remarks:

Phase 2

Sample
Ambient
Net Concentration

Remarks:

Phase 3

Sample
Ambient
Net Concentration

Remarks:

Phase 4

Sample
Ambient
Net Concentration

Remarks: This test has particulate results.

Results	N2O	THC / IntTHC	CO	NOx	CO2	CH4	NMHC	Vol MPG
	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(mpg)
Phase 1	0.069	- / 0.008	0.032	0.692	706.3	0.005	0.003	14.453

NMOG=NMHC

Fuel Economy

	Diesel MPG
Phase 1	14.41

Dyno Settings	
Aug Brake	Dyno #: D329 - AWD
Y	Inertia: 9500
	EPA Set Co A: -16.94
	EPA Set Co B: -0.5339
	EPA Set Co C: 0.04960
AWD	Emiss-Bench: Mexa 7200dle

NVFEL Laboratory Test Data

CVS

Final Laboratory Test Results - NOTE: Variance from CFR procedures per OECA-OAR QAPP October 2015

Test Number: 2016-0026-011 Vehicle ID: FORD F250-184W121

Results	N2O (grams)	THC / IntTHC (grams)	CO (grams)	NOx (grams)	CO2 (grams)	CH4 (grams)	NMHC (grams)	Meth Response
Phase 1	0.245	- / 0.028	0.116	2.467	2519.2	0.018	0.011	1.075

Test Conditions	Phase 1	Phase 2	Phase 3	Phase 4
Barometer (inHg)	28.65			
Avg Cell Temp (degF)	73.88			
Dew Point (degF)	46.89			
Specific Humidity (grains/lbm)	49.72			
NOx Corr Factor	0.8938			
CO2 Dilution Factor	17.530			
CFV Vmix (scf @68F)	6710.14			
Total CVS Vmix (scf@68F)	6736.20			
CVS Flow Rate Avg (scfm)	675.52			
Fan Placement:	Road Speed Fan			
Phase Time (secs)	596.00			
Distance (miles)	3.567			
Bag Analysis Time (secs)	85.2			

	MFR
IWR % diff	-
ASCR % diff	-
EER	-

NVFEL Laboratory Test Data — PARTICULATE

Final Laboratory Test Results - NOTE: Variance from CFR procedures per OECA-OAR QAPP October 2015

Test Number: 2016-0026-011 — Vehicle ID: FORD F250-184W121

Test Information

Test Date:	10/29/2015	MFR Name	Ford Motor Company
Key Start:	11:10:03	MFR Codes:	FMX 30
Fuel Container ID:	F00023 / 25330	Config #:	00
Fuel Type:	19 Cert Diesel 7-15 ppm Sulfur	Transmission:	Auto
Test Procedure:	8.09 sc03wu_sc03	Shift Schedule:	A0EPA0005
Calculation Method:	Diesel	Beginning Odometer:	052940.0 MI
Pretest Remarks:		Drive Schedule:	sc03wu_sc03

All filter weights are corrected for buoyancy.

Particulate	Filter Sampler	Filter No.	Tare (Pre Wt)	Gross (Post Wt)	Net Wt mg	Total Mass mg	Total Mass mg / mi	Filter comment
Phase 1	A	220215253	372.8152	372.8166	0.00139	1.081	0.303	
	B	220215254	372.3134	372.3140	0.00058	0.446	0.125	
	C	220215255	358.4432	358.4441	0.00084	0.656	0.184	

Remarks:

Phase 2

Remarks:

Phase 3

Remarks:

Phase 4

Remarks: This test has particulate results.

Average Results

	Net Wt mg	Total Mass mg	Total Mass mg / mi
Phase 1	0.00094	0.728	0.204

All filter weights are corrected for buoyancy.

Reference Filter Stability Check

2% of Avg Net or 0.01 mg

PM Media
MTL PTFE_PFA

No.	Tare (Pre Wt)	Gross (Post Wt)	Net Wt mg	Stability Check PASS/FAIL
1	365.48542	365.48528	-0.00014	PASS
2	365.77353	365.77279	-0.00074	PASS

0.01

Dyno #: D329 - AWD
Inertia: 9500
EPA Set Co A: -16.94
EPA Set Co B: -0.5339
EPA Set Co C: 0.04960

Emissions Benc Mexa 7200dle

NVFEL Laboratory Test Data

PARTICULATE

Final Laboratory Test Results - NOTE: Variance from CFR procedures per OECA-OAR QAPP October 2015

Test Number: 2016-0026-011 Vehicle ID: FORD F250-184W121

WEIGHING CHAMBER	Timestamp	Buoyancy Factor	Operator (id)	Chamber Temp (°F)	Dew Point (°F)	Barometer ("Hg)	Last Change in Status Status @ timestamp
Pre-test	10/28/15 15:25	1.0003827	322990	71.9	49.6	28.47	NORM @ 10/28/15 09:58:32
Post-test	10/29/15 13:24	1.0003859	322990	71.3	49.5	28.67	NORM @ 10/28/15 09:58:32

Test Conditions	Phase 1	Phase 2	Phase 3	Phase 4
Barometer (inHg)	28.65			
Avg Cell Temp (degF)	73.88			
Dew Point (degF)	46.89			
Specific Humidity (grains/lbm)	49.72			
NOx Corr Factor	0.8938			
Dilution Factor	17.53			
CFV Vmix (scf @68F)	6710.14			
Sample Volume A (scf @68F)	8.634			
Sample Volume B (scf @68F)	8.807			
Sample Volume C (scf @68F)	8.620			
Sample Volume D (scf @68F)				
Sample Volume Average (scf @68F)	8.687			
Total PM Vmix (scf @68F)	6736.20			
Phase Time (sec)	596.00			
Distance (miles)	3.567			
PSU Probe A (degC)				
PSU Probe B (degC)				
PSU Probe C (degC)				
PSU Dil Air A (degC)	43.8			
PSU Dil Air B (degC)	39.6			
PSU Dil Air C (degC)	40.4			
PSU Filter A (degC)	45.6			
PSU Filter B (degC)	47.7			
PSU Filter C (degC)	48.5			
PSU Dil Flow A (lpm)	29.5			
PSU Dil Flow B (lpm)	29.5			
PSU Dil Flow C (lpm)	29.5			
PSU A Proportionality				
PSU B Proportionality				
PSU C Proportionality				

NVFEL Laboratory Test Data

CVS

Final Laboratory Test Results

Test Number: 2016-0026-010 Vehicle ID: FORD F250-184W121

Test Information

Test Date:	10/29/2015	MFR Name	Ford Motor Company
Key Start:	10:15:18	MFR Codes:	FMX 30
Fuel Container ID / FTAG:	F00023 / 25330	Config #:	00
Fuel Type:	19 Cert Diesel 7-15 ppm Sulfur	Transmission:	Auto
Test Procedure:	89 us062bag (us06warmup_2bagus06)	Shift Schedule:	A0EPA0041
FE Calculation Method:	Diesel	Beginning Odometer:	052926.0 MI
Pretest Remarks:		Drive Schedule:	us06warmup_2bagus06
Drive Axle:	AWD		

Bag Data	N2O	THC / IntTHC	CO	NOx	CO2	CH4	NMHC
Phase 1	(ppm)	(ppmC)	(ppm)	(ppm)	(%)	(ppm)	(ppmC)
Sample	1.431	1.749 / 1.648	0.697	40.040	1.637	1.754	
Ambient	0.331	1.912	0.004	0.373	0.053	1.984	
Net Concentration	1.140	0.070 / 0.000	0.693	39.712	1.591	0.012	-0.013

Remarks: PSU Proportionality out of CFR specifications - variant test

Phase 2							
Sample	1.502	1.767 / 1.712	0.723	16.965	1.893	1.909	
Ambient	0.330	1.895	0.000	0.077	0.048	1.973	
Net Concentration	1.219	0.140 / 0.085	0.723	16.899	1.851	0.214	-0.145

Remarks:

Phase 3

Sample
Ambient
Net Concentration

Remarks:

Phase 4

Sample
Ambient
Net Concentration

Remarks: This test has particulate results.

Results	N2O	THC / IntTHC	CO	NOx	CO2	CH4	NMHC	Vol MPG
	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(mpg)
Phase 1	0.086	- / 0.000	0.033	2.815	1205.5	0.000	0.000	8.468
Phase 2	0.040	- / 0.001	0.015	0.516	604.1	0.003	0.000	16.898
							NMOG=NMHC	
Composite	0.05009	0.00068	0.01909	1.02454	737.214	0.00206	0.00000	

Fuel Economy	Diesel MPG	Dyno Settings	
Phase 1	8.44	Aug Brake	Dyno #: D329 - AWD
Phase 2	16.84	Y	Inertia: 9500
			EPA Set Co A: -16.94
			EPA Set Co B: -0.5339
			EPA Set Co C: 0.04960
Composite	13.81	AWD	Emiss-Bench: Mexa 7200dle

NVFEL Laboratory Test Data

Final Laboratory Test Results

CVS

Test Number: 2016-0026-010 Vehicle ID: FORD F250-184W121

Results	N2O (grams)	THC / IntTHC (grams)	CO (grams)	NOx (grams)	CO2 (grams)	CH4 (grams)	NMHC (grams)	Meth Response 1.075
Phase 1	0.153	- / 0.000	0.059	4.980	2132.8	0.001	0.000	
Phase 2	0.248	- / 0.005	0.094	3.210	3760.3	0.016	0.000	

Test Conditions	Phase 1	Phase 2	Phase 3	Phase 4
Barometer (inHg)	28.63	28.63		
Avg Cell Temp (degF)	73.92	74.04		
Dew Point (degF)	46.43	47.34		
Specific Humidity (grains/lbm)	48.90	50.62		
NOx Corr Factor	0.8907	0.8972		
CO2 Dilution Factor	8.183	7.079		
CFV Vmix (scf @68F)	2577.44	3904.74		
Total CVS Vmix (scf@68F)	2587.67	3920.18		
CVS Flow Rate Avg (scfm)	649.23	641.88		
Fan Placement:	Road Speed Fan			
Phase Time (secs)	130.00	365.00	108.20	
Distance (miles)	1.769	6.224		
Bag Analysis Time (secs)	57.8	240.0		

	US06-C	US06-H	US06-T	MFR
IWR % diff	0.040	-5.159	-2.490	-
ASCR % diff	-0.351	-3.970	-1.497	-
EER	0.231	-1.113	-0.682	-

NVFEL Laboratory Test Data

PARTICULATE

Final Laboratory Test Results

Test Number: 2016-0026-010 Vehicle ID: FORD F250-184W121

Test Information

Test Date:	10/29/2015	MFR Name	Ford Motor Company
Key Start:	10:15:18	MFR Codes:	FMX 30
Fuel Container ID:	F00023 / 25330	Config #:	00
Fuel Type:	19 Cert Diesel 7-15 ppm Sulfur	Transmission:	Auto
Test Procedure:	89 us062bag (us06warmup_2bagus06)	Shift Schedule:	A0EPA0041
Calculation Method:	Diesel	Beginning Odometer:	052926.0 MI
Pretest Remarks:		Drive Schedule:	us06warmup_2bagus06

All filter weights are corrected for buoyancy

Particulate	Filter Sampler	Filter No.	Tare (Pre Wt)	Gross (Post Wt)	Net Wt mg	Total Mass mg	Total Mass mg / mi	Filter comment
Phase 1	A	220215159	361.7224	361.7293	0.00691	5.294	0.662	
	B	220215160	363.1353	363.1430	0.00770	5.809	0.727	
	C	220215161	362.1477	362.1487	0.00101	0.767	0.096	

Remarks: PSU Proportionality out of CFR specifications - variant test

Phase 2

Remarks:

Phase 3

Remarks:

Phase 4

Remarks: This test has particulate results.

Average Results	Net Wt mg	Total Mass mg	Total Mass mg / mi
Phase 1	0.00521	3.957	0.495

All filter weights are corrected for buoyancy

Reference Filter Stability Check		Tare	Gross	Net Wt	Stability Check		
2% of Avg Net or 0.01 mg	No.	(Pre Wt)	(Post Wt)	mg	PASS/FAIL	Dyno #:	D329 - AWD
0.01	1	365.48675	365.48572	-0.00103	PASS	Inertia:	9500
	2	365.77337	365.77243	-0.00093	PASS	EPA Set Co A:	-16.94
						EPA Set Co B:	-0.5339
PM Media						EPA Set Co C:	0.04960
MTL PTFE_PFA							
						Emissions Bench:	Mexa 7200dle

NVFEL Laboratory Test Data

PARTICULATE

Final Laboratory Test Results

Test Number: 2016-0026-010 Vehicle ID: FORD F250-184W121

WEIGHING CHAMBER	Timestamp	Buoyancy Factor	Operator (id)	Chamber Temp (°F)	Dew Point (°F)	Barometer ("Hg)	Last Change in Status Status @ timestamp
Pre-test	10/27/15 9:09	1.0003954	322990	72.1	50	29.42	NORM @ 10/26/15 08:33:35
Post-test	10/29/15 12:10	1.0003852	322990	71.7	49.7	28.64	NORM @ 10/28/15 09:58:32

Test Conditions	Phase 1	Phase 2	Phase 3	Phase 4
Barometer (inHg)	28.63	28.63		
Avg Cell Temp (degF)	73.92	74.04		
Dew Point (degF)	46.43	47.34		
Specific Humidity (grains/lbm)	48.90	50.62		
NOx Corr Factor	0.8907	0.8972		
Dilution Factor	8.18	7.08		
CFV Vmix (scf @68F)	2577.44	3904.74		
Sample Volume A (scf @68F)	8.499	5.147		
Sample Volume B (scf @68F)	8.625	5.148		
Sample Volume C (scf @68F)	8.546	5.143		
Sample Volume D (scf @68F)				
Sample Volume Average (scf @68F)	8.557	5.146		
Total PM Vmix (scf @68F)	2587.67	3920.18		
Phase Time (sec)	130.00	365.00	108.20	
Distance (miles)	1.769	6.224		
PSU Probe A (degC)				
PSU Probe B (degC)				
PSU Probe C (degC)				
PSU Dil Air A (degC)	45.7	45.3		
PSU Dil Air B (degC)	40.9	40.7		
PSU Dil Air C (degC)	42.3	42.0		
PSU Filter A (degC)	47.8	47.9		
PSU Filter B (degC)	48.7	48.5		
PSU Filter C (degC)	49.2	48.8		
PSU Dil Flow A (lpm)	29.1	28.8		
PSU Dil Flow B (lpm)	29.1	28.8		
PSU Dil Flow C (lpm)	29.1	28.8		
PSU A Proportionality				
PSU B Proportionality				
PSU C Proportionality				

NVFEL Laboratory Test Data

CVS

Final Laboratory Test Results

Test Number: 2016-0026-016 Vehicle ID: FORD F250-184W121

Test Information

Test Date:	11/10/2015	MFR Name:	Ford Motor Company
Key Start / Hot Soak:	09:41:07 / 10:06	MFR Codes:	FMX 30
Fuel Container ID / FTAG:	F00023 / 25330	Config #:	00
Fuel Type:	19 Cert Diesel 7-15 ppm Sulfur	Transmission:	Auto
Test Procedure:	02 CVS 75-Later (w/o Can Load) (ftp3bag)	Shift Schedule:	A0EPA0005
FE Calculation Method:	Diesel	Beginning Odometer:	052973.0 MI
Pretest Remarks:		Drive Schedule:	ftp3bag
Drive Axle:	AWD	Soak Period:	17.9 hours

Bag Data	N2O (ppm)	THC / IntTHC (ppmC)	CO (ppm)	NOx (ppm)	CO2 (%)	CH4 (ppm)	NMHC (ppmC)
Phase 1							
Sample	0.877	17.178 / 20.334	61.340	7.645	0.932	3.711	
Ambient	0.321	2.393	0.168	0.015	0.045	2.046	
Net Concentration	0.579	14.953 / 18.109	61.184	7.631	0.891	1.808	16.165

Remarks:

Phase 2							
Sample	0.770	3.241 / 2.786	0.504	1.251	0.574	2.233	
Ambient	0.321	2.380	0.068	0.012	0.045	2.039	
Net Concentration	0.463	0.963 / 0.509	0.440	1.240	0.530	0.282	0.206

Remarks:

Phase 3							
Sample	0.969	3.550 / 3.501	13.178	3.989	0.774	2.474	
Ambient	0.324	2.305	0.047	0.013	0.045	2.033	
Net Concentration	0.664	1.378 / 1.329	13.133	3.977	0.732	0.559	0.728

Remarks:

Phase 4							
Sample							
Ambient							
Net Concentration							

Remarks: This test has particulate results

Results	N2O (gpm)	THC / IntTHC (gpm)	CO (gpm)	NOx (gpm)	CO2 (gpm)	CH4 (gpm)	NMHC (gpm)	Vol MPG (mpg)
Phase 1	0.049	- / 0.488	3.328	0.611	761.1	0.056	0.435	13.294
Phase 2	0.063	- / 0.022	0.038	0.158	719.8	0.014	0.009	14.181
Phase 3	0.056	- / 0.036	0.711	0.317	622.3	0.017	0.020	16.373
Weighted	0.05832	0.12216	0.90443	0.29515	701.576	0.02366	NMOG=NMHC 0.10017	

Fuel Economy

	Diesel MPG
Phase 1	13.25
Phase 2	14.14
Phase 3	16.32
Weighted	14.46

Dyno Settings	
Dyno #:	D329 - AWD
Aug Brake	Inertia: 9500
Y	EPA Set Co A: -16.94
	EPA Set Co B: -0.5339
	EPA Set Co C: 0.04960
AWD	Emiss-Bench: Mexa 7200dle

NVFEL Laboratory Test Data

CVS

Final Laboratory Test Results

Test Number: 2016-0026-016 Vehicle ID: FORD F250-184W121

Results	N2O (grams)	THC / IntTHC (grams)	CO (grams)	NOx (grams)	CO2 (grams)	CH4 (grams)	NMHC (grams)	Meth Response
								1.075
Phase 1	0.177	- / 1.742	11.886	2.181	2718.7	0.201	1.555	
Phase 2	0.241	- / 0.084	0.146	0.605	2763.3	0.053	0.034	
Phase 3	0.201	- / 0.127	2.535	1.129	2219.3	0.062	0.070	

Test Conditions	Phase 1	Phase 2	Phase 3	Phase 4
Barometer (inHg)	29.14	29.14	29.13	
Avg Cell Temp (degF)	74.05	74.00	74.04	
Dew Point (degF)	47.83	47.26	47.80	
Specific Humidity (grains/lbm)	50.66	49.57	50.63	
NOx Corr Factor	0.8974	0.8932	0.8972	
CO2 Dilution Factor	14.254	23.333	17.269	
CFV Vmix (scf @68F)	5866.47	10006.06	5825.15	
Total CVS Vmix (scf@68F)	5892.29	10055.53	5854.11	
CVS Flow Rate Avg (scfm)	693.98	689.12	689.23	
Fan Placement:	Road Speed Fan			
Phase Time (secs)	507.20	871.20	507.10	
Distance (miles)	3.572	3.839	3.566	
Bag Analysis Time (secs)	954.3	158.1	158.8	

	FTP B1	FTP B2	FTP B3	FTP-W	MFR
IWR % diff	-1.453	0.319	-1.208	-0.452	-
ASCR % diff	-0.466	0.378	-0.476	0.059	-
EER	-0.596	0.500	-0.473	-0.038	-

NVFEL Laboratory Test Data

PARTICULATE

Final Laboratory Test Results

Test Number: 2016-0026-016 | Vehicle ID: FORD F250-184W121

Test Information

Test Date:	11/10/2015	MFR Name:	Ford Motor Company
Key Start:	09:41:07 / 10:06	MFR Codes:	FMX 30
Fuel Container ID:	F00023 / 25330	Config #:	00
Fuel Type:	19 Cert Diesel 7-15 ppm Sulfur	Transmission:	Auto
Test Procedure:	02 CVS 75-Later (w/o Can Load) (ftp3bag)	Shift Schedule:	A0EPA0005
Calculation Method:	Diesel	Beginning Odometer:	052973.0 MI
Pretest Remarks:		Drive Schedule:	ftp3bag
		Soak Period:	17.9 hours

All filter weights are corrected for buoyancy.

Particulate	Filter Sampler	Filter No.	Tare (Pre Wt)	Gross (Post Wt)	Net Wt mg	Total Mass mg	Total Mass mg / mi	Filter comment
Phase 1	A	220215331	368.7616	368.7620	0.00032	0.257	0.072	
	B	220215334	366.7988	366.7996	0.00083	0.446	0.125	
	C	220215337	365.3697	365.3714	0.00173	1.374	0.385	
Remarks:								
Phase 2	A	220215332	367.6082	367.6087	0.00053	0.415	0.108	
	B	220215335	367.7732	367.7751	0.00183	0.767	0.200	
	C	220215338	363.1279	363.1302	0.00224	1.767	0.460	
Remarks:								
Phase 3	A	220215333	367.7275	367.7257	0.00000	0.000	0.000	
	B	220215336	361.5208	361.5238	0.00304	1.252	0.351	
	C	220215339	363.2575	363.2606	0.00314	2.501	0.701	
Remarks:								
Phase 4								
Remarks:	This test has particulate results.							

Average Results	Net Wt mg	Total Mass mg	Total Mass mg / mi
Phase 1	0.00096	0.692	0.194
Phase 2	0.00153	0.983	0.256
Phase 3	0.00206	1.876	0.526

All filter weights are corrected for buoyancy.

Weighted All Filters: 0.31727

Reference Filter Stability Check	No	Tare (Pre Wt)	Gross (Post Wt)	Net Wt mg	Stability Check PASS/FAIL
2% of Avg Net or 0.01 mg					
0.01	1	365.48995	365.48948	-0.00047	PASS
	2	365.77426	365.77249	-0.00177	PASS

PM Media
MTL PTFE_PFA

Dyno #: D329 - AWD
Inertia: 9500
EPA Set Co A: -16.94
EPA Set Co B: -0.5339
EPA Set Co C: 0.04960

Emissions Benc Mexa 7200dle

NVFEL Laboratory Test Data

PARTICULATE

Final Laboratory Test Results

Test Number: 2016-0026-016 Vehicle ID: FORD F250-184W121

WEIGHING CHAMBER	Timestamp	Buoyancy Factor	Operator (id)	Chamber Temp (°F)	Dew Point (°F)	Barometer ("Hg)	Last Change in Status Status @ timestamp
Pre-test	11/9/15 13:36	1.0003940	322990	71.6	49.7	29.29	NORM @ 11/06/15 20:40:22
Post-test	11/10/15 12:04	1.0003913	322990	71.6	49.6	29.09	NORM @ 11/06/15 20:40:22

Test Conditions	Phase 1	Phase 2	Phase 3	Phase 4
Barometer (inHg)	29.14	29.14	29.13	
Avg Cell Temp (degF)	74.05	74.00	74.04	
Dew Point (degF)	47.83	47.26	47.80	
Specific Humidity (grains/lbm)	50.66	49.57	50.63	
NOx Corr Factor	0.8974	0.8932	0.8972	
Dilution Factor	14.25	23.33	17.27	
CFV Vmix (scf @68F)	5866.47	10006.06	5825.15	
Sample Volume A (scf @68F)	7.427	12.762	7.371	
Sample Volume B (scf @68F)	10.958	23.964	14.239	
Sample Volume C (scf @68F)	7.437	12.746	7.351	
Sample Volume D (scf @68F)				
Sample Volume Average (scf @68F)	8.607	16.491	9.653	
Total PM Vmix (scf @68F)	5892.29	10055.53	5854.11	
Phase Time (sec)	507.20	871.20	507.10	
Distance (miles)	3.572	3.839	3.566	
PSU Probe A (degC)				
PSU Probe B (degC)				
PSU Probe C (degC)				
PSU Dil Air A (degC)	45.1	45.2	44.5	
PSU Dil Air B (degC)	42.7	39.9	40.6	
PSU Dil Air C (degC)	41.2	41.6	40.5	
PSU Filter A (degC)	45.8	46.0	47.3	
PSU Filter B (degC)	47.8	48.4	49.2	
PSU Filter C (degC)	49.1	49.1	48.1	
PSU Dil Flow A (lpm)	29.9	29.9	29.7	
PSU Dil Flow B (lpm)	29.9	29.9	29.7	
PSU Dil Flow C (lpm)	29.8	29.9	29.6	
PSU A Proportionality				
PSU B Proportionality				
PSU C Proportionality				

NVFEL Laboratory Test Data

CVS

Final Laboratory Test Results

Test Number: 2016-0026-018 Vehicle ID: FORD F250-184W121

Test Information

Test Date:	11/10/2015	MFR Name	Ford Motor Company
Key Start:	11:30:05	MFR Codes:	FMX 30
Fuel Container ID / FTAG:	F00023 / 25330	Config #:	00
Fuel Type:	19 Cert Diesel 7-15 ppm Sulfur	Transmission:	Auto
Test Procedure:	3 HWFET (hwfetprep_hwfet)	Shift Schedule:	A0EPA0011
FE Calculation Method:	Diesel	Beginning Odometer:	052984.0 MI
Pretest Remarks:		Drive Schedule:	hwfetwarmup_hwfet
Drive Axle:	AWD		

Bag Data	N2O	THC / IntTHC	CO	NOx	CO2	CH4	NMHC
Phase 1	(ppm)	(ppmC)	(ppm)	(ppm)	(%)	(ppm)	(ppmC)
Sample	0.767	2.508 / 2.475	0.578	0.877	1.016	2.200	
Ambient	0.326	2.312	0.035	0.014	0.045	2.033	
Net Concentration	0.466	0.372 / 0.338	0.546	0.864	0.974	0.321	-0.008

Remarks:

Phase 2

Sample
Ambient
Net Concentration

Remarks:

Phase 3

Sample
Ambient
Net Concentration

Remarks:

Phase 4

Sample
Ambient
Net Concentration

Remarks: This test has particulate results.

Results	N2O	THC / IntTHC	CO	NOx	CO2	CH4	NMHC	Vol MPG
	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(mpg)
Phase 1	0.021	- / 0.005	0.015	0.036	430.8	0.005	0.000	23.694

NMOG=NMHC

Fuel Economy

	Diesel MPG
Phase 1	23.62

Dyno Settings		
Aug Brake	Dyno #:	D329 - AWD
Y	Inertia:	9500
	EPA Set Co A:	-16.94
	EPA Set Co B:	-0.5339
-	EPA Set Co C:	0.04960
AWD	Emiss-Bench:	Mexa 7200dle

NVFEL Laboratory Test Data

CVS

Final Laboratory Test Results

Test Number: 2016-0026-018 Vehicle ID: FORD F250-184W121

Results	N2O (grams)	THC / IntTHC (grams)	CO (grams)	NOx (grams)	CO2 (grams)	CH4 (grams)	NMHC (grams)	Meth Response
Phase 1	0.211	- / 0.048	0.157	0.366	4403.6	0.053	0.000	1.075

Test Conditions	Phase 1	Phase 2	Phase 3	Phase 4
Barometer (inHg)	29.13			
Avg Cell Temp (degF)	73.94			
Dew Point (degF)	47.78			
Specific Humidity (grains/lbm)	50.57			
NOx Corr Factor	0.8970			
CO2 Dilution Factor	13.186			
CFV Vmix (scf @68F)	8683.17			
Total CVS Vmix (scf@68F)	8726.22			
CVS Flow Rate Avg (scfm)	680.94			
Fan Placement:	Road Speed Fan			
Phase Time (secs)	765.10			
Distance (miles)	10.222			
Bag Analysis Time (secs)	57.8			

	HWY	MFR
IWR % diff	-3.573	-
ASCR % diff	-3.059	-
EER	-0.992	-

NVFEL Laboratory Test Data

PARTICULATE

Final Laboratory Test Results

Test Number: 2016-0026-018 — Vehicle ID: FORD F250-184W121

Test Information

Test Date:	11/10/2015	MFR Name:	Ford Motor Company
Key Start:	11:30:05	MFR Codes:	FMX 30
Fuel Container ID:	F00023 / 25330	Config #:	00
Fuel Type:	19 Cert Diesel 7-15 ppm Sulfur	Transmission:	Auto
Test Procedure:	3 HWFET (hwfetprep_hwfet)	Shift Schedule:	A0EPA0011
Calculation Method:	Diesel	Beginning Odometer:	052984.0 MI
Pretest Remarks:		Drive Schedule:	hwfetwarmup_hwfet

All filter weights are corrected for buoyancy.

Particulate	Filter Sampler	Filter No.	Tare (Pre Wt)	Gross (Post Wt)	Net Wt mg	Total Mass mg	Total Mass mg / mi	Filter comment
Phase 1	A	220215323	360.7570	360.7621	0.00508	3.972	0.389	
	B	220215324	360.6551	360.6603	0.00518	2.178	0.213	
	C	220215325	362.9660	362.9659	0.00000	0.000	0.000	

Remarks:

Phase 2

Remarks:

Phase 3

Remarks:

Phase 4

Remarks: This test has particulate results.

Average Results

	Net Wt mg	Total Mass mg	Total Mass mg / mi
Phase 1	0.00342	3.075	0.301

All filter weights are corrected for buoyancy.

Reference Filter Stability Check

2% of Avg Net or 0.01 mg: 0.01

PM Media: MTL PTFE_PFA

No.	Tare (Pre Wt)	Gross (Post Wt)	Net Wt mg	Stability Check PASS/FAIL
1	365.48984	365.48970	-0.00014	PASS
2	365.77455	365.77441	-0.00014	PASS

Dyno #: D329 - AWD
Inertia: 9500
EPA Set Co A: -16.94
EPA Set Co B: -0.5339
EPA Set Co C: 0.04960

Emissions Benc Mexa 7200dle

NVFEL Laboratory Test Data

PARTICULATE

Final Laboratory Test Results

Test Number: 2016-0026-018 Vehicle ID: FORD F250-184W121

WEIGHING CHAMBER	Timestamp	Buoyancy Factor	Operator (id)	Chamber Temp (°F)	Dew Point (°F)	Barometer ("Hg)	Last Change in Status Status @ timestamp
Pre-test	11/9/15 13:54	1.0003943	322990	71.2	49.5	29.28	NORM @ 11/06/15 20:40:22
Post-test	11/10/15 13:46	1.0003911	322990	71.5	49.6	29.07	NORM @ 11/06/15 20:40:22

Test Conditions	Phase 1	Phase 2	Phase 3	Phase 4
Barometer (inHg)	29.13			
Avg Cell Temp (degF)	73.94			
Dew Point (degF)	47.78			
Specific Humidity (grains/lbm)	50.57			
NOx Corr Factor	0.8970			
Dilution Factor	13.19			
CFV Vmix (scf @68F)	8683.17			
Sample Volume A (scf @68F)	11.157			
Sample Volume B (scf @68F)	20.744			
Sample Volume C (scf @68F)	11.150			
Sample Volume D (scf @68F)				
Sample Volume Average (scf @68F)	14.350			
Total PM Vmix (scf @68F)	8726.22			
Phase Time (sec)	765.10			
Distance (miles)	10.222			
PSU Probe A (degC)				
PSU Probe B (degC)				
PSU Probe C (degC)				
PSU Dil Air A (degC)	43.8			
PSU Dil Air B (degC)	39.8			
PSU Dil Air C (degC)	40.3			
PSU Filter A (degC)	47.3			
PSU Filter B (degC)	51.0			
PSU Filter C (degC)	50.3			
PSU Dil Flow A (lpm)	29.8			
PSU Dil Flow B (lpm)	29.8			
PSU Dil Flow C (lpm)	29.7			
PSU A Proportionality				
PSU B Proportionality				
PSU C Proportionality				

NVFEL Laboratory Test Data

CVS

Final Laboratory Test Results - NOTE: Variance from CFR procedures per OECA-OAR QAPP October 2015

Test Number: 2016-0026-020 Vehicle ID: FORD F250-184W121

Test Information

Test Date:	11/10/2015	MFR Name	Ford Motor Company
Key Start:	14:17:57	MFR Codes:	FMX 30
Fuel Container ID / FTAG:	F00023 / 25330	Config #:	00
Fuel Type:	19 Cert Diesel 7-15 ppm Sulfur	Transmission:	Auto
Test Procedure:	8.09 sc03wu_sc03	Shift Schedule:	A0EPA0005
FE Calculation Method:	Diesel	Beginning Odometer:	053019.0 MI
Pretest Remarks:		Drive Schedule:	sc03wu_sc03
Drive Axle:	AWD		

Bag Data	N2O	THC / IntTHC	CO	NOx	CO2	CH4	NMHC
Phase 1	(ppm)	(ppmC)	(ppm)	(ppm)	(%)	(ppm)	(ppmC)
Sample	0.728	2.610 / 2.499	0.433	4.656	0.491	2.100	
Ambient	0.328	2.315	0.069	0.021	0.044	2.085	
Net Concentration	0.411	0.380 / 0.269	0.367	4.636	0.449	0.092	0.170

Remarks:

Phase 2

Sample
Ambient
Net Concentration

Remarks:

Phase 3

Sample
Ambient
Net Concentration

Remarks:

Phase 4

Sample
Ambient
Net Concentration

Remarks: This test has particulate results.

Results	N2O	THC / IntTHC	CO	NOx	CO2	CH4	NMHC	Vol MPG
	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(mpg)
Phase 1	0.060	- / 0.012	0.034	0.630	652.6	0.005	0.008	15.641

NMOG=NMHC

Fuel Economy	Diesel MPG
Phase 1	15.59

Dyno Settings		
Aug Brake	Dyno #:	D329 - AWD
Y	Inertia:	9500
	EPA Set Co A:	-16.94
	EPA Set Co B:	-0.5339
	EPA Set Co C:	0.04960
AWD	Emiss-Bench:	Mexa 7200dle

NVFEL Laboratory Test Data

CVS

Final Laboratory Test Results - NOTE: Variance from CFR procedures per OECA-OAR QAPP October 2015

Test Number: 2016-0026-020 Vehicle ID: FORD F250-184W121

Results	N2O (grams)	THC / IntTHC (grams)	CO (grams)	NOx (grams)	CO2 (grams)	CH4 (grams)	NMHC (grams)	Meth Response
Phase 1	0.213	- / 0.044	0.121	2.244	2325.1	0.017	0.028	1.075

Test Conditions	Phase 1	Phase 2	Phase 3	Phase 4
Barometer (inHg)	29.08			
Avg Cell Temp (degF)	74.06			
Dew Point (degF)	47.44			
Specific Humidity (grains/lbm)	50.01			
NOx Corr Factor	0.8949			
CO2 Dilution Factor	27.250			
CFV Vmix (scf @68F)	9954.50			
Total CVS Vmix (scf@68F)	9988.33			
CVS Flow Rate Avg (scfm)	1002.13			
Fan Placement	Road Speed Fan			
Phase Time (secs)	596.00			
Distance (miles)	3.563			
Bag Analysis Time (secs)	168.1			

	MFR
IWR % diff	-
ASCR % diff	-
EER	-

NVFEL Laboratory Test Data — PARTICULATE

Final Laboratory Test Results - NOTE: Variance from CFR procedures per OECA-OAR QAPP October 2015

Test Number: 2016-0026-020 — Vehicle ID: FORD F250-184W121

Test Information

Test Date:	11/10/2015	MFR Name:	Ford Motor Company
Key Start:	14:17:57	MFR Codes:	FMX 30
Fuel Container ID:	F00023 / 25330	Config #:	00
Fuel Type:	19 Cert Diesel 7-15 ppm Sulfur	Transmission:	Auto
Test Procedure:	8.09 sc03wu_sc03	Shift Schedule:	A0EPA0005
Calculation Method:	Diesel	Beginning Odometer:	053019.0 MI
Pretest Remarks:		Drive Schedule:	sc03wu_sc03

All filter weights are corrected for buoyancy.

Particulate	Filter Sampler	Filter No.	Tare (Pre Wt)	Gross (Post Wt)	Net Wt mg	Total Mass mg	Total Mass mg / mi	Filter comment
Phase 1	A	220215343	364.8195	364.8224	0.00289	3.332	0.935	
	B	220215344	367.3810	367.3800	0.00000	0.000	0.000	
	C	220215345	365.3926	365.3914	0.00000	0.000	0.000	

Remarks:

Phase 2

Remarks:

Phase 3

Remarks:

Phase 4

Remarks: This test has particulate results.

Average Results

	Net Wt mg	Total Mass mg	Total Mass mg / mi
Phase 1	0.00096	3.332	0.935

All filter weights are corrected for buoyancy.

Reference Filter Stability Check

2% of Avg Net or 0.01 mg: 0.01

PM Media: MTL PTFE_PFA

No.	Tare (Pre Wt)	Gross (Post Wt)	Net Wt mg	Stability Check PASS/FAIL
1	365.49038	365.48937	-0.00101	PASS
2	365.77459	365.77398	-0.00061	PASS

Dyno #: D329 - AWD
Inertia: 9500
EPA Set Co A: -16.94
EPA Set Co B: -0.5339
EPA Set Co C: 0.04960

Emissions Benc Mexa 7200dle

inal Laboratory Test Results - NOTE: Variance from CFR procedures per OECA-OAR QAPP October 2015

Test Number: 2016-0026-020 Vehicle ID: FORD F250-184W121

WEIGHING CHAMBER	Timestamp	Buoyancy Factor	Operator (id)	Chamber Temp (°F)	Dew Point (°F)	Barometer ("Hg)	Last Change in Status Status @ timestamp
Pre-test	11/9/15 14:04	1.0003941	322990	71.3	49.4	29.28	NORM @ 11/06/15 20:40:22
Post-test	11/10/15 15:48	1.0003908	322990	71.9	49.6	29.06	NORM @ 11/06/15 20:40:22

Test Conditions	Phase 1	Phase 2	Phase 3	Phase 4
Barometer (inHg)	29.08			
Avg Cell Temp (degF)	74.06			
Dew Point (degF)	47.44			
Specific Humidity (grains/lbm)	50.01			
NOx Corr Factor	0.8949			
Dilution Factor	27.25			
CFV Vmix (scf @68F)	9954.50			
Sample Volume A (scf @68F)	8.669			
Sample Volume B (scf @68F)	16.475			
Sample Volume C (scf @68F)	8.688			
Sample Volume D (scf @68F)				
Sample Volume Average (scf @68F)	11.277			
Total PM Vmix (scf @68F)	9988.33			
Phase Time (sec)	596.00			
Distance (miles)	3.563			
PSU Probe A (degC)				
PSU Probe B (degC)				
PSU Probe C (degC)				
PSU Dil Air A (degC)	43.9			
PSU Dil Air B (degC)	39.5			
PSU Dil Air C (degC)	40.5			
PSU Filter A (degC)	45.5			
PSU Filter B (degC)	48.6			
PSU Filter C (degC)	48.4			
PSU Dil Flow A (lpm)	29.7			
PSU Dil Flow B (lpm)	29.7			
PSU Dil Flow C (lpm)	29.7			
PSU A Proportionality				
PSU B Proportionality				
PSU C Proportionality				

NVFEL Laboratory Test Data

CVS

Final Laboratory Test Results

Test Number: 2016-0026-019 Vehicle ID: FORD F250-184W121

Test Information

Test Date:	11/10/2015	MFR Name:	Ford Motor Company
Key Start:	13:20:54	MFR Codes:	FMX 30
Fuel Container ID / FTAG:	F00023 / 25330	Config #:	00
Fuel Type:	19 Cert Diesel 7-15 ppm Sulfur	Transmission:	Auto
Test Procedure:	89 us062bag (us06warmup_2bagus06)	Shift Schedule:	A0EPA0041
FE Calculation Method:	Diesel	Beginning Odometer:	053004.0 MI
Pretest Remarks:		Drive Schedule:	us06warmup_2bagus06
Drive Axle:	AWD		

Bag Data	N2O	THC / IntTHC	CO	NOx	CO2	CH4	NMHC
Phase 1	(ppm)	(ppmC)	(ppm)	(ppm)	(%)	(ppm)	(ppmC)
Sample	0.913	2.223 / 2.058	0.660	21.905	1.083	1.878	
Ambient	0.328	2.203	0.137	0.085	0.045	2.051	
Net Concentration	0.612	0.198 / 0.033	0.534	21.827	1.042	0.000	0.033

Remarks: Variant Test

Phase 2							
Sample	0.854	2.116 / 2.052	0.698	9.558	1.209	1.966	
Ambient	0.328	2.206	0.115	0.038	0.046	2.066	
Net Concentration	0.556	0.109 / 0.045	0.594	9.524	1.167	0.086	-0.048

Remarks:

Phase 3							
Sample							
Ambient							
Net Concentration							

Remarks:

Phase 4							
Sample							
Ambient							
Net Concentration							

Remarks: This test has particulate results.

Results	N2O	THC / IntTHC	CO	NOx	CO2	CH4	NMHC	Vol MPG
	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(mpg)
Phase 1	0.070	- / 0.001	0.039	2.358	1198.9	0.000	0.001	8.515
Phase 2	0.027	- / 0.001	0.019	0.442	576.7	0.002	0.000	17.700
							NMOG=NMHC	
Composite	0.03690	0.00081	0.02317	0.86268	713.293	0.00122	0.00027	

Fuel Economy	Diesel MPG	Dyno Settings	Dyno #: D329 - AWD
Phase 1	8.49	Aug Brake	Inertia: 9500
Phase 2	17.64	Y	EPA Set Co A: -16.94
			EPA Set Co B: -0.5339
			EPA Set Co C: 0.04960
Composite	14.27	AWD	Emiss-Bench: Mexa 7200dle

NVFEL Laboratory Test Data

CVS

Final Laboratory Test Results

Test Number: 2016-0026-019 Vehicle ID: FORD F250-184W121

Results	N2O (grams)	THC / IntTHC (grams)	CO (grams)	NOx (grams)	CO2 (grams)	CH4 (grams)	NMHC (grams)	Meth Response
Phase 1	0.123	- / 0.002	0.068	4.123	2095.9	0.000	0.002	1.075
Phase 2	0.171	- / 0.004	0.116	2.747	3584.5	0.010	0.000	

Test Conditions	Phase 1	Phase 2	Phase 3	Phase 4
Barometer (inHg)	29.09	29.09		
Avg Cell Temp (degF)	73.91	74.00		
Dew Point (degF)	48.00	47.91		
Specific Humidity (grains/lbm)	51.09	50.90		
NOx Corr Factor	0.8990	0.8983		
CO2 Dilution Factor	12.368	11.085		
CFV Vmix (scf @68F)	3869.78	5909.20		
Total CVS Vmix (scf@68F)	3883.08	5929.59		
CVS Flow Rate Avg (scfm)	977.22	971.64		
Fan Placement	Road Speed Fan			
Phase Time (secs)	130.00	364.90	107.60	
Distance (miles)	1.748	6.215		
Bag Analysis Time (secs)	100.6	282.2		

	US06-C	US06-H	US06-T	MFR
IWR % diff	-0.761	-13.755	-7.084	-
ASCR % diff	-0.586	-10.288	-3.659	-
EER	-0.031	-2.835	-2.039	-

NVFEL Laboratory Test Data

PARTICULATE

Final Laboratory Test Results

Test Number: 2016-0026-019 Vehicle ID: FORD F250-184W121

Test Information

Test Date:	11/10/2015	MFR Name:	Ford Motor Company
Key Start:	13:20:54	MFR Codes:	FMX 30
Fuel Container ID:	F00023 / 25330	Config #:	00
Fuel Type:	19 Cert Diesel 7-15 ppm Sulfur	Transmission:	Auto
Test Procedure:	89 us062bag (us06warmup_2bagus06)	Shift Schedule:	A0EPA0041
Calculation Method:	Diesel	Beginning Odometer:	053004.0 MI
Pretest Remarks:		Drive Schedule:	us06warmup_2bagus06

All filter weights are corrected for buoyancy.

Particulate	Filter Sampler	Filter No.	Tare (Pre Wt)	Gross (Post Wt)	Net Wt mg	Total Mass mg	Total Mass mg / mi	Filter comment
Phase 1	A	220215340	365.6795	365.6813	0.00188	2.127	0.267	
	B	220215341	363.1937	363.1945	0.00078	0.467	0.059	
	C	220215342	364.6151	364.6181	0.00298	3.390	0.426	

Remarks: Variant Test

Phase 2

Remarks:

Phase 3

Remarks:

Phase 4

Remarks: This test has particulate results.

Average Results

	Net Wt mg	Total Mass mg	Total Mass mg / mi
Phase 1	0.00188	1.995	0.250

All filter weights are corrected for buoyancy.

Reference Filter Stability Check

2% of Avg Net or 0.01 mg	No.	Tare (Pre Wt)	Gross (Post Wt)	Net Wt mg	Stability Check PASS/FAIL
0.01	1	365.49038	365.48946	-0.00093	PASS
	2	365.77459	365.77407	-0.00053	PASS

PM Media
MTL PTFE_PFA

Dyno #: D329 - AWD
Inertia: 9500
EPA Set Co A: -16.94
EPA Set Co B: -0.5339
EPA Set Co C: 0.04960

Emissions Benc Mexa 7200dle

NVFEL Laboratory Test Data

PARTICULATE

Final Laboratory Test Results

Test Number: 2016-0026-019 Vehicle ID: FORD F250-184W121

WEIGHING CHAMBER	Timestamp	Buoyancy Factor	Operator (id)	Chamber Temp (°F)	Dew Point (°F)	Barometer ("Hg)	Last Change in Status Status @ timestamp
Pre-test	11/9/15 14:04	1.0003941	322990	71.3	49.4	29.28	NORM @ 11/06/15 20:40:22
Post-test	11/10/15 15:01	1.0003913	322990	71.1	49.6	29.06	NORM @ 11/06/15 20:40:22

Test Conditions	Phase 1	Phase 2	Phase 3	Phase 4
Barometer (inHg)	29.09	29.09		
Avg Cell Temp (degF)	73.91	74.00		
Dew Point (degF)	48.00	47.91		
Specific Humidity (grains/lbm)	51.09	50.90		
NOx Corr Factor	0.8990	0.8983		
Dilution Factor	12.37	11.08		
CFV Vmix (scf @68F)	3869.78	5909.20		
Sample Volume A (scf @68F)	8.649	5.227		
Sample Volume B (scf @68F)	16.408	9.946		
Sample Volume C (scf @68F)	8.622	5.211		
Sample Volume D (scf @68F)				
Sample Volume Average (scf @68F)	11.226	6.795		
Total PM Vmix (scf @68F)	3883.08	5929.59		
Phase Time (sec)	130.00	364.90	107.60	
Distance (miles)	1.748	6.215		
PSU Probe A (degC)				
PSU Probe B (degC)				
PSU Probe C (degC)				
PSU Dil Air A (degC)	44.7	44.5		
PSU Dil Air B (degC)	39.9	39.7		
PSU Dil Air C (degC)	41.2	41.0		
PSU Filter A (degC)	46.8	46.8		
PSU Filter B (degC)	49.5	49.6		
PSU Filter C (degC)	48.9	48.7		
PSU Dil Flow A (lpm)	29.4	29.2		
PSU Dil Flow B (lpm)	29.4	29.2		
PSU Dil Flow C (lpm)	29.4	29.2		
PSU A Proportionality				
PSU B Proportionality				
PSU C Proportionality				

NVFEL Laboratory Test Data

CVS

Final Laboratory Test Results

Test Number: 2016-0030-002 — Vehicle ID: FORD F150-294W597

Test Information

Test Date:	11/3/2015	MFR Name:	Ford Motor Company
Key Start / Hot Soak:	10:05:02 / 10:25	MFR Codes:	FMX 30
Fuel Container ID / FTAG:	F00021 / 25278	Config #:	00
Fuel Type:	61 Tier 2 Cert Test Fuel	Transmission:	Auto
Test Procedure:	21 Fed Fuel 2-day Exhaust (CAN LOAD)(ftp	Shift Schedule:	A0EPA0005
FE Calculation Method:	Gasoline	Beginning Odometer:	047036.0 MI
Pretest Remarks:		Drive Schedule:	ftp3bag
Drive Axle:	AWD	Soak Period:	16.5 hours

Bag Data	N2O	HC-FID	CO	NOx	CO2	CH4	NMHC
Phase 1	(ppm)	(ppmC)	(ppm)	(ppm)	(%)	(ppm)	(ppmC)
Sample	0.373	8.592	27.034	1.004	1.078	2.915	
Ambient	0.325	2.330	0.221	0.016	0.049	2.057	
Net Concentration	0.074	6.450	26.831	0.989	1.033	1.024	5.349

Remarks:

Phase 2							
Sample	0.311	2.217	2.309	0.025	0.648	1.993	
Ambient	0.326	2.290	0.071	0.012	0.047	2.059	
Net Concentration	0.001	0.037	2.241	0.013	0.603	0.033	0.001

Remarks:

Phase 3							
Sample	0.400	3.321	24.161	0.340	0.915	2.463	
Ambient	0.327	2.208	0.000	0.012	0.046	2.021	
Net Concentration	0.096	1.264	24.161	0.329	0.873	0.581	0.640

Remarks:

Phase 4							
Sample							
Ambient							
Net Concentration							

Remarks:

Results	N2O	HC-FID	CO	NOx	CO2	CH4	NMHC	Vol MPG
	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(mpg)
Phase 1	0.004	0.122	1.023	0.056	619.0	0.022	0.101	14.354
Phase 2	0.000	0.001	0.136	0.001	576.5	0.001	0.000	15.454
Phase 3	0.006	0.024	0.921	0.018	522.6	0.013	0.012	17.006
							NMOG=1.04 x NMHC	
Weighted	0.00254	0.03240	0.53585	0.01723	570.516	0.00873	0.0243 / 0.0253	

Fuel Economy	Gasoline MPG
Phase 1	14.34
Phase 2	15.44
Phase 3	16.99
Weighted	15.57

Dyno Settings	
Aug Brake	Dyno #: D329 - AWD
Y	Inertia: 6000
	EPA Set Co A: -12.59
	EPA Set Co B: -0.0583
	EPA Set Co C: 0.03829
AWD	Emiss-Bench: Mexa 7200dle

NVFEL Laboratory Test Data

CVS

Final Laboratory Test Results

Test Number: 2016-0030-002 Vehicle ID: FORD F150-294W597

Results	N2O (grams)	HC-FID (grams)	CO (grams)	NOx (grams)	CO2 (grams)	CH4 (grams)	NMHC (grams)	Meth Response 1.075
Phase 1	0.016	0.436	3.662	0.199	2215.0	0.080	0.362	
Phase 2	0.000	0.004	0.524	0.004	2215.7	0.004	0.000	
Phase 3	0.021	0.085	3.295	0.066	1870.7	0.045	0.043	

Test Conditions	Phase 1	Phase 2	Phase 3	Phase 4
Barometer (inHg)	29.25	29.25	29.25	
Avg Cell Temp (degF)	74.23	74.08	73.94	
Dew Point (degF)	48.12	48.29	47.84	
Specific Humidity (grains/lbm)	51.03	51.37	50.49	
NOx Corr Factor	0.8987	0.9000	0.8967	
CO2 Dilution Factor	12.388	20.672	14.596	
CFV Vmix (scf @68F)	4139.94	7094.01	4136.41	
CVS Flow Rate Avg (scfm)	489.26	488.68	489.03	
Fan Placement: Road Speed Fan				
Phase Time (secs)	507.70	871.00	507.50	
Distance (miles)	3.579	3.843	3.579	
Bag Analysis Time (secs)	938.4	142.4	63.8	

	FTP B1	FTP B2	FTP B3	FTP-W	MFR
IWR % diff	-0.924	-1.171	-0.443	-0.925	-
ASCR % diff	-0.751	-0.615	-0.397	-0.591	-
EER	-0.674	-0.398	-0.707	-0.551	-

NVFEL Laboratory Test Data

CVS

Final Laboratory Test Results

Test Number: 2016-0030-003 Vehicle ID: FORD F150-294W597

Test Information

Test Date: 11/3/2015 MFR Name Ford Motor Company
Key Start: 11:20:46 MFR Codes: FMX 30
Fuel Container ID / FTAG: F00021 / 25278 Config #: 00
Fuel Type: 61 Tier 2 Cert Test Fuel Transmission: Auto
Test Procedure: 3 HWFET (hwfetprep_hwfet) Shift Schedule: A0EPA0011
FE Calculation Method: Gasoline Beginning Odometer: 047047.0 MI
Pretest Remarks: Drive Schedule: hwfetwarmup_hwfet
Drive Axle: AWD

Bag Data	N2O	HC-FID	CO	NOx	CO2	CH4	NMHC
Phase 1	(ppm)	(ppmC)	(ppm)	(ppm)	(%)	(ppm)	(ppmC)
Sample	0.336	2.352	3.156	0.148	1.240	2.130	
Ambient	0.322	2.151	0.000	0.014	0.047	2.016	
Net Concentration	0.044	0.400	3.156	0.136	1.197	0.301	0.077

Remarks:

Phase 2

Sample
Ambient
Net Concentration

Remarks:

Phase 3

Sample
Ambient
Net Concentration

Remarks:

Phase 4

Sample
Ambient
Net Concentration

Remarks:

Results	N2O	HC-FID	CO	NOx	CO2	CH4	NMHC	Vol MPG
	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(mpg)
Phase 1	0.001	0.004	0.063	0.004	373.2	0.003	0.001	23.875

NMOG=1.04 x NMHC

Fuel Economy

	Gasoline MPG
Phase 1	23.85

Dyno Settings	
Aug Brake	Dyno #: D329 - AWD
Y	Inertia: 6000
	EPA Set Co A: -12.59
	EPA Set Co B: -0.0583
	EPA Set Co C: 0.03829
AWD	Emiss-Bench: Mexa 7200dle

NVFEL Laboratory Test Data

CVS

Final Laboratory Test Results

Test Number: 2016-0030-003 Vehicle ID: FORD F150-294W597

Results	N2O (grams)	HC-FID (grams)	CO (grams)	NOx (grams)	CO2 (grams)	CH4 (grams)	NMHC (grams)	Meth Response
Phase 1	0.014	0.040	0.641	0.041	3818.0	0.035	0.008	1.075

Test Conditions	Phase 1	Phase 2	Phase 3	Phase 4
Barometer (inHg)	29.25			
Avg Cell Temp (degF)	73.91			
Dew Point (degF)	48.26			
Specific Humidity (grains/lbm)	51.31			
NOx Corr Factor	0.8998			
CO2 Dilution Factor	10.806			
CFV Vmix (scf @68F)	6156.76			
CVS Flow Rate Avg (scfm)	482.82			
Fan Placement:	Road Speed Fan			
Phase Time (secs)	765.10			
Distance (miles)	10.230			
Bag Analysis Time (secs)	62.2			

	HWY	MFR
IWR % diff	0.212	-
ASCR % diff	-0.006	-
EER	-0.606	-

NVFEL Laboratory Test Data

CVS

Final Laboratory Test Results - NOTE: Variance from CFR procedures per OECA-OAR QAPP October 2015

Test Number: 2016-0030-005 Vehicle ID: FORD F150-294W597

Test Information

Test Date:	11/3/2015	MFR Name	Ford Motor Company
Key Start:	12:58:49	MFR Codes:	FMX 30
Fuel Container ID / FTAG:	F00021 / 25278	Config #:	00
Fuel Type:	61 Tier 2 Cert Test Fuel	Transmission:	Auto
Test Procedure:	8.09 sc03wu_sc03	Shift Schedule:	A0EPA0005
FE Calculation Method:	Gasoline	Beginning Odometer:	047084.0 MI
Pretest Remarks:		Drive Schedule:	sc03wu_sc03
Drive Axle:	AWD		

Bag Data	N2O	HC-FID	CO	NOx	CO2	CH4	NMHC
Phase 1	(ppm)	(ppmC)	(ppm)	(ppm)	(%)	(ppm)	(ppmC)
Sample	0.365	3.315	19.217	0.915	0.870	2.429	
Ambient	0.326	2.145	0.077	0.013	0.044	1.982	
Net Concentration	0.061	1.309	19.144	0.903	0.828	0.576	0.690

Remarks:

Phase 2

Sample
Ambient
Net Concentration

Remarks:

Phase 3

Sample
Ambient
Net Concentration

Remarks:

Phase 4

Sample
Ambient
Net Concentration

Remarks:

Results	N2O	HC-FID	CO	NOx	CO2	CH4	NMHC	Vol MPG
	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(mpg)
Phase 1	0.004	0.029	0.856	0.060	582.0	0.015	0.015	15.279

NMOG=1.04 x NMHC

Fuel Economy

	Gasoline MPG
Phase 1	15.26

Dyno Settings	
Aug Brake	Dyno #: D329 - AWD
Y	Inertia: 6000
	EPA Set Co A: -12.59
	EPA Set Co B: -0.0583
	EPA Set Co C: 0.03829
AWD	Emiss-Bench: Mexa 7200dle

NVFEL Laboratory Test Data

CVS

Final Laboratory Test Results - NOTE: Variance from CFR procedures per OECA-OAR QAPP October 2015

Test Number: 2016-0030-005 Vehicle ID: FORD F150-294W597

Results	N2O (grams)	HC-FID (grams)	CO (grams)	NOx (grams)	CO2 (grams)	CH4 (grams)	NMHC (grams)	Meth Response
Phase 1	0.015	0.103	3.056	0.213	2077.7	0.053	0.055	1.075

Test Conditions	Phase 1	Phase 2	Phase 3	Phase 4
Barometer (inHg)	29.22			
Avg Cell Temp (degF)	74.22			
Dew Point (degF)	48.11			
Specific Humidity (grains/lbm)	51.05			
NOx Corr Factor	0.8988			
CO2 Dilution Factor	15.363			
CFV Vmix (scf @68F)	4840.93			
CVS Flow Rate Avg (scfm)	487.34			
Fan Placement:	Road Speed Fan			
Phase Time (secs)	596.00			
Distance (miles)	3.570			
Bag Analysis Time (secs)	58.0			

	MFR
IWR % diff	-
ASCR % diff	-
EER	-

NVFEL Laboratory Test Data

CVS

Final Laboratory Test Results

Test Number: 2016-0030-004 Vehicle ID: FORD F150-294W597

Test Information

Test Date: 11/3/2015 MFR Name Ford Motor Company
Key Start: 12:02:01 MFR Codes: FMX 30
Fuel Container ID / FTAG: F00021 / 25278 Config #: 00
Fuel Type: 61 Tier 2 Cert Test Fuel Transmission: Auto
Test Procedure: 89 us062bag (us06warmup_2bagus06) Shift Schedule: A0EPA0041
FE Calculation Method: Gasoline Beginning Odometer: 047068.0 MI
Pretest Remarks: Drive Schedule: us06warmup_2bagus06
Drive Axle: AWD

Bag Data	N2O	HC-FID	CO	NOx	CO2	CH4	NMHC
Phase 1	(ppm)	(ppmC)	(ppm)	(ppm)	(%)	(ppm)	(ppmC)
Sample	0.420	4.092	24.838	1.293	0.830	2.549	
Ambient	0.324	2.166	0.326	0.013	0.044	1.999	
Net Concentration	0.116	2.061	24.532	1.280	0.789	0.674	1.336

Remarks:

Phase 2							
Sample	0.416	4.253	35.082	2.505	1.149	2.609	
Ambient	0.323	2.216	0.175	0.015	0.045	2.011	
Net Concentration	0.120	2.228	34.922	2.491	1.108	0.771	1.400

Remarks:

Phase 3

Sample
Ambient
Net Concentration

Remarks:

Phase 4

Sample
Ambient
Net Concentration

Remarks:

Results	N2O	HC-FID	CO	NOx	CO2	CH4	NMHC	Vol MPG
	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(mpg)
Phase 1	0.012	0.068	1.633	0.126	825.3	0.026	0.044	10.764
Phase 2	0.006	0.032	1.015	0.107	506.1	0.013	0.020	17.553
							NMOG=1.04 x NMHC	
Composite	0.00698	0.04006	1.15265	0.11130	577.093	0.01570	0.0255 / 0.0265	

Fuel Economy

	Gasoline MPG
Phase 1	10.75
Phase 2	17.54
Composite	15.38

Dyno Settings	
Aug Brake	Dyno #: D329 - AWD
Y	Inertia: 6000
	EPA Set Co A: -12.59
	EPA Set Co B: -0.0583
	EPA Set Co C: 0.03829
AWD	Emiss-Bench: Mexa 7200dle

NVFEL Laboratory Test Data

CVS

Final Laboratory Test Results

Test Number: 2016-0030-004 Vehicle ID: FORD F150-294W597

Results	N2O (grams)	HC-FID (grams)	CO (grams)	NOx (grams)	CO2 (grams)	CH4 (grams)	NMHC (grams)	Meth Response
Phase 1	0.022	0.121	2.913	0.225	1472.0	0.046	0.079	1.075
Phase 2	0.034	0.200	6.332	0.668	3156.4	0.080	0.126	

Test Conditions	Phase 1	Phase 2	Phase 3	Phase 4
Barometer (inHg)	29.23	29.23		
Avg Cell Temp (degF)	74.46	74.58		
Dew Point (degF)	48.46	48.16		
Specific Humidity (grains/lbm)	51.73	51.13		
NOx Corr Factor	0.9014	0.8991		
CO2 Dilution Factor	16.085	11.620		
CFV Vmix (scf @68F)	3601.04	5499.55		
CVS Flow Rate Avg (scfm)	912.42	904.04		
Fan Placement: Road Speed Fan				
Phase Time (secs)	130.00	365.00	106.80	
Distance (miles)	1.784	6.237		
Bag Analysis Time (secs)	66.5	247.3		

	US06-C	US06-H	US06-T	MFR
IWR % diff	-2.413	-4.180	-3.273	-
ASCR % diff	-0.764	-3.320	-1.574	-
EER	-2.585	-0.831	-1.274	-

NVFEL Laboratory Test Data

CVS

Final Laboratory Test Results

Test Number: 2016-0030-006 Vehicle ID: FORD F150-294W597

Test Information

Test Date: 11/6/2015 MFR Name: Ford Motor Company
Key Start / Hot Soak: 08:18:10 / 09:21 MFR Codes: FMX 30
Fuel Container ID / FTAG: F00021 / 25278 Config #: 00
Fuel Type: 61 Tier 2 Cert Test Fuel Transmission: Auto
Test Procedure: 21 Fed Fuel 2-day Exhaust (CAN LOAD)(ftp Shift Schedule: A0EPA0005
FE Calculation Method: Gasoline Beginning Odometer: 047107.0 MI
Pretest Remarks: Drive Schedule: ftp3bag
Drive Axle: AWD Soak Period: 16.0 hours

Bag Data	N2O	HC-FID	CO	NOx	CO2	CH4	NMHC
Phase 1	(ppm)	(ppmC)	(ppm)	(ppm)	(%)	(ppm)	(ppmC)
Sample	0.380	8.033	26.591	1.552	1.102	2.869	
Ambient	0.324	2.060	0.000	0.014	0.045	1.957	
Net Concentration	0.083	6.143	26.591	1.540	1.061	1.074	4.989
Remarks:							
Phase 2							
Sample	0.310	2.064	5.681	0.031	0.663	1.923	
Ambient	0.325	2.134	0.000	0.007	0.045	1.973	
Net Concentration	0.002	0.035	5.681	0.024	0.621	0.048	-0.016
Remarks:							
Phase 3							
Sample	0.351	3.171	19.669	0.282	0.931	2.324	
Ambient	0.326	2.059	0.000	0.011	0.045	1.959	
Net Concentration	0.048	1.255	19.669	0.272	0.889	0.502	0.715
Remarks:							
Phase 4							
Sample							
Ambient							
Net Concentration							
Remarks:							

Results	N2O	HC-FID	CO	NOx	CO2	CH4	NMHC	Vol MPG
	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(mpg)
Phase 1	0.005	0.113	0.985	0.087	617.4	0.023	0.092	14.392
Phase 2	0.000	0.001	0.334	0.002	574.0	0.002	0.000	15.513
Phase 3	0.003	0.023	0.731	0.015	519.4	0.011	0.013	17.120
							NMOG=1.04 x NMHC	
Weighted	0.00184	0.03019	0.57758	0.02342	568.066	0.00848	0.0226 / 0.0235	

Fuel Economy

	Gasoline MPG
Phase 1	14.38
Phase 2	15.50
Phase 3	17.10
Weighted	15.65

Dyno Settings: Aug Brake Y AWD

Dyno #: D329 - AWD
Inertia: 6000
EPA Set Co A: -12.59
EPA Set Co B: -0.0583
EPA Set Co C: 0.03829
Emiss-Bench: Mexa 7200dle

NVFEL Laboratory Test Data

CVS

Final Laboratory Test Results

Test Number: 2016-0030-006 Vehicle ID: FORD F150-294W597

Results	N2O (grams)	HC-FID (grams)	CO (grams)	NOx (grams)	CO2 (grams)	CH4 (grams)	NMHC (grams)	Meth Response
Phase 1	0.018	0.407	3.557	0.315	2230.1	0.082	0.331	1.075
Phase 2	0.001	0.004	1.301	0.009	2233.7	0.006	0.000	
Phase 3	0.010	0.083	2.628	0.056	1867.1	0.038	0.047	

Test Conditions	Phase 1	Phase 2	Phase 3	Phase 4
Barometer (inHg)	28.84	28.85	28.86	
Avg Cell Temp (degF)	74.01	73.96	73.98	
Dew Point (degF)	51.90	51.81	51.32	
Specific Humidity (grains/lbm)	59.70	59.48	58.37	
NOx Corr Factor	0.9329	0.9320	0.9275	
CO2 Dilution Factor	12.121	20.178	14.360	
CFV Vmix (scf @68F)	4057.66	6945.34	4052.71	
CVS Flow Rate Avg (scfm)	479.91	479.15	479.42	
Fan Placement:	Road Speed Fan			
Phase Time (secs)	507.30	869.70	507.20	
Distance (miles)	3.612	3.891	3.595	
Bag Analysis Time (secs)	927.2	131.5	59.4	

	FTP B1	FTP B2	FTP B3	FTP-W	MFR
IWR % diff	-1.705	-2.763	-3.061	-2.629	-
ASCR % diff	-1.252	-1.691	-1.887	-1.662	-
EER	-1.003	-1.397	-0.696	-1.122	-

NVFEL Laboratory Test Data

CVS

Final Laboratory Test Results

Test Number: 2016-0030-007 Vehicle ID: FORD F150-294W597

Test Information

Test Date:	11/6/2015	MFR Name	Ford Motor Company
Key Start:	09:29:36	MFR Codes:	FMX 30
Fuel Container ID / FTAG:	F00021 / 25278	Config #:	00
Fuel Type:	61 Tier 2 Cert Test Fuel	Transmission:	Auto
Test Procedure:	3 HWFET (hwfetprep_hwfet)	Shift Schedule:	A0EPA0011
FE Calculation Method:	Gasoline	Beginning Odometer:	047119.0 MI
Pretest Remarks:		Drive Schedule:	hwfetwarmup_hwfet
Drive Axle:	AWD		

Bag Data	N2O	HC-FID	CO	NOx	CO2	CH4	NMHC
Phase 1	(ppm)	(ppmC)	(ppm)	(ppm)	(%)	(ppm)	(ppmC)
Sample	0.345	2.601	5.547	0.182	1.252	2.154	
Ambient	0.326	2.232	0.000	0.011	0.046	1.980	
Net Concentration	0.050	0.578	5.547	0.172	1.210	0.359	0.192

Remarks:

Phase 2

Sample
Ambient
Net Concentration

Remarks:

Phase 3

Sample
Ambient
Net Concentration

Remarks:

Phase 4

Sample
Ambient
Net Concentration

Remarks:

Results	N2O	HC-FID	CO	NOx	CO2	CH4	NMHC	Vol MPG
	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(mpg)
Phase 1	0.002	0.006	0.108	0.005	368.7	0.004	0.002	24.164

NMOG=1.04 x NMHC

Fuel Economy

	Gasoline MPG
Phase 1	24.14

Dyno Settings		
Aug Brake	Dyno #:	D329 - AWD
Y	Inertia:	6000
	EPA Set Co A:	-12.59
	EPA Set Co B:	-0.0583
-	EPA Set Co C:	0.03829
AWD	Emiss-Bench:	Mexa 7200dle

NVFEL Laboratory Test Data

CVS

Final Laboratory Test Results

Test Number: 2016-0030-007 Vehicle ID: FORD F150-294W597

Results	N2O (grams)	HC-FID (grams)	CO (grams)	NOx (grams)	CO2 (grams)	CH4 (grams)	NMHC (grams)	Meth Response
Phase 1	0.016	0.057	1.103	0.051	3781.7	0.041	0.019	1.075

Test Conditions	Phase 1	Phase 2	Phase 3	Phase 4
Barometer (inHg)	28.88			
Avg Cell Temp (degF)	73.89			
Dew Point (degF)	50.15			
Specific Humidity (grains/lbm)	55.82			
NOx Corr Factor	0.9173			
CO2 Dilution Factor	10.698			
CFV Vmix (scf @68F)	6030.69			
CVS Flow Rate Avg (scfm)	472.93			
Fan Placement	Road Speed Fan			
Phase Time (secs)	765.10			
Distance (miles)	10.257			
Bag Analysis Time (secs)	58.2			

	HWY	MFR
IWR % diff	-1.283	-
ASCR % diff	-1.468	-
EER	-0.208	-

NVFEL Laboratory Test Data

CVS

Final Laboratory Test Results - NOTE: Variance from CFR procedures per OECA-OAR QAPP October 2015

Test Number: 2016-0030-009 Vehicle ID: FORD F150-294W597

Test Information

Test Date:	11/6/2015	MFR Name	Ford Motor Company
Key Start:	10:58:23	MFR Codes:	FMX 30
Fuel Container ID / FTAG:	F00021 / 25278	Config #:	00
Fuel Type:	61 Tier 2 Cert Test Fuel	Transmission:	Auto
Test Procedure:	8.09 sc03wu_sc03	Shift Schedule:	A0EPA0005
FE Calculation Method:	Gasoline	Beginning Odometer:	047156.0 MI
Pretest Remarks:		Drive Schedule:	sc03wu_sc03
Drive Axle:	AWD		

Bag Data	N2O	HC-FID	CO	NOx	CO2	CH4	NMHC
Phase 1	(ppm)	(ppmC)	(ppm)	(ppm)	(%)	(ppm)	(ppmC)
Sample	0.339	3.257	12.426	0.858	0.886	2.342	
Ambient	0.326	2.310	0.000	0.007	0.044	2.012	
Net Concentration	0.034	1.100	12.426	0.852	0.845	0.463	0.602

Remarks:

Phase 2

Sample
Ambient
Net Concentration

Remarks:

Phase 3

Sample
Ambient
Net Concentration

Remarks:

Phase 4

Sample
Ambient
Net Concentration

Remarks:

Results	N2O	HC-FID	CO	NOx	CO2	CH4	NMHC	Vol MPG
	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(mpg)
Phase 1	0.002	0.024	0.545	0.056	582.4	0.012	0.013	15.281

NMOG=1.04 x NMHC

Fuel Economy	Gasoline MPG	Dyno Settings	
Phase 1	15.27	Aug Brake	Dyno #: D329 - AWD
		Y	Inertia: 6000
			EPA Set Co A: -12.59
			EPA Set Co B: -0.0583
			EPA Set Co C: 0.03829
		AWD	Emiss-Bench: Mexa 7200dle

NVFEL Laboratory Test Data

CVS

Final Laboratory Test Results - NOTE: Variance from CFR procedures per OECA-OAR QAPP October 2015

Test Number: 2016-0030-009 Vehicle ID: FORD F150-294W597

Results	N2O (grams)	HC-FID (grams)	CO (grams)	NOx (grams)	CO2 (grams)	CH4 (grams)	NMHC (grams)	Meth Response
Phase 1	0.008	0.086	1.951	0.199	2084.0	0.042	0.047	1.075

Test Conditions	Phase 1	Phase 2	Phase 3	Phase 4
Barometer (inHg)	28.92			
Avg Cell Temp (degF)	74.20			
Dew Point (degF)	48.82			
Specific Humidity (grains/lbm)	53.01			
NOx Corr Factor	0.9063			
CO2 Dilution Factor	15.098			
CFV Vmix (scf @68F)	4762.54			
CVS Flow Rate Avg (scfm)	479.45			
Fan Placement	Road Speed Fan			
Phase Time (secs)	596.00			
Distance (miles)	3.578			
Bag Analysis Time (secs)	58.0			

	MFR
IWR % diff	-
ASCR % diff	-
EER	-

NVFEL Laboratory Test Data

CVS

Final Laboratory Test Results

Test Number: 2016-0030-008 Vehicle ID: FORD F150-294W597

Test Information

Test Date: 11/6/2015 MFR Name: Ford Motor Company
Key Start: 10:10:14 MFR Codes: FMX 30
Fuel Container ID / FTAG: F00021 / 25278 Config #: 00
Fuel Type: 61 Tier 2 Cert Test Fuel Transmission: Auto
Test Procedure: 89 us062bag (us06warmup_2bagus06) Shift Schedule: A0EPA0041
FE Calculation Method: Gasoline Beginning Odometer: 047140.0 MI
Pretest Remarks: Drive Schedule: us06warmup_2bagus06
Drive Axle: AWD

Bag Data	N2O	HC-FID	CO	NOx	CO2	CH4	NMHC
Phase 1	(ppm)	(ppmC)	(ppm)	(ppm)	(%)	(ppm)	(ppmC)
Sample	0.450	7.794	265.212	2.252	0.988	3.471	
Ambient	0.326	2.561	0.000	0.010	0.046	1.992	
Net Concentration	0.148	5.427	265.212	2.242	0.946	1.629	3.675

Remarks: Variant Test

Phase 2							
Sample	0.389	9.067	354.252	1.445	1.337	3.883	
Ambient	0.324	2.642	0.000	0.011	0.046	1.999	
Net Concentration	0.098	6.696	354.252	1.435	1.296	2.089	4.450

Remarks:

Phase 3							
Sample							
Ambient							
Net Concentration							

Remarks:

Phase 4							
Sample							
Ambient							
Net Concentration							

Remarks:

Results	N2O	HC-FID	CO	NOx	CO2	CH4	NMHC	Vol MPG
	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(mpg)
Phase 1	0.013	0.153	15.081	0.192	845.0	0.053	0.104	10.255
Phase 2	0.004	0.082	8.748	0.053	502.8	0.030	0.054	17.246
							NMOG=1.04 x NMHC	
Composite	0.00591	0.09763	10.15236	0.08426	578.669	0.03478	0.0653 / 0.0679	

Fuel Economy

	Gasoline MPG
Phase 1	10.25
Phase 2	17.23
Composite	14.96

Dyno Settings	
Aug Brake	Dyno #: D329 - AWD
Y	Inertia: 6000
	EPA Set Co A: -12.59
	EPA Set Co B: -0.0583
	EPA Set Co C: 0.03829
AWD	Emiss-Bench: Mexa 7200dle

NVFEL Laboratory Test Data

CVS

Final Laboratory Test Results

Test Number: 2016-0030-008 Vehicle ID: FORD F150-294W597

Results	N2O (grams)	HC-FID (grams)	CO (grams)	NOx (grams)	CO2 (grams)	CH4 (grams)	NMHC (grams)	Meth Response
								1.075
Phase 1	0.024	0.272	26.804	0.342	1501.7	0.094	0.184	
Phase 2	0.024	0.511	54.590	0.334	3137.6	0.184	0.340	

Test Conditions	Phase 1	Phase 2	Phase 3	Phase 4
Barometer (inHg)	28.90	28.90		
Avg Cell Temp (degF)	74.35	74.42		
Dew Point (degF)	50.23	50.29		
Specific Humidity (grains/lbm)	55.94	56.06		
NOx Corr Factor	0.9178	0.9183		
CO2 Dilution Factor	13.201	9.759		
CFV Vmix (scf @68F)	3065.45	4673.90		
CVS Flow Rate Avg (scfm)	776.72	768.31		
Fan Placement	Road Speed Fan			
Phase Time (secs)	130.00	365.00	106.80	
Distance (miles)	1.777	6.240		
Bag Analysis Time (secs)	58.2	241.0		

	US06-C	US06-H	US06-T	MFR
IWR % diff	0.051	-7.007	-3.383	-
ASCR % diff	0.457	-5.490	-1.427	-
EER	-0.599	-0.879	-0.786	-

Paired Data Offset of ≥3% Report

	MFR	Num
VID:		

Test Numbers

	Date	Dyno
FTP		
HFET		
US06		

MPH	Load EPA Lbs	Mfr. Lbs.	Delta %	target	veh EPA	veh Mfr
10	82.245	84.137	2.30%	84.137	1.892	0
20	106.952	110.736	3.54%	110.736	3.784	0
30	139.101	144.777	4.08%	144.777	5.676	0
40	178.692	186.26	4.24%	186.26	7.568	0
50	225.725	235.185	4.19%	235.185	9.46	0
60	280.2	291.552	4.05%	291.552	11.352	0

Vehicle+Set= Target

Quickcheck CD % Diff	#DIV/0!

Offset Summary

		EPA	MFG	Mfg Diff%
FTP	FE			#DIV/0!
	THC			#DIV/0!
	CO			#DIV/0!
	NOx			#DIV/0!
	CO2			#DIV/0!
	CH4			#DIV/0!
	NMHC			#DIV/0!
HFET	FE			#DIV/0!
	THC			#DIV/0!
	CO			#DIV/0!
	NOx			#DIV/0!
	CO2			#DIV/0!
	CH4			#DIV/0!
	NMHC	0	0	#DIV/0!

		EPA	MFG	Mfg Diff%
US06	FE (Bag2)			#DIV/0!
	FE (Total)			#DIV/0!
	THC			#DIV/0!
	CO			#DIV/0!
	NOx			#DIV/0!
	CO2			#DIV/0!
	CH4			#DIV/0!
	NMHC			#DIV/0!

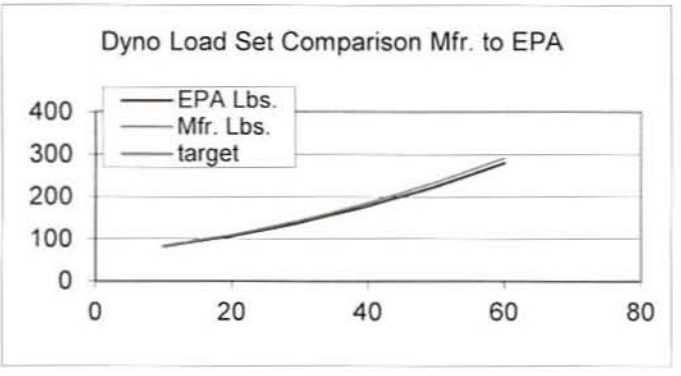
Dyno Set Coeffs.

	EPA	MFG	Target
A	64.98	64.98	64.98
B	1.3544	1.5436	1.5436
C	0.03721	0.03721	0.03721

Finding: FTP *Test results and related information indicate results are* *valid*
HFET
US06

Observations on finding:

1
2
3



Difference
1.892
3.784
5.676
7.568
9.46
11.352

Results reviewed by _____ *Signature* _____ *Date*

Notices

*****Reminder, Februarys Entry Is Up*****

The Diesel Place, Billet License Plate Frame Give Away.

Fifth Generation Duramax Electronics/Tuners Discuss **2011+ LML** Duramax engine electronic upgrades including chips, tuners, programmers, etc.

04-11-2011, 04:28 PM #1 (permalink)

20Duramax11
Diesel Enthusiast

Join Date: Dec 2010
Posts: 5
iTrader Score: 0 reviews

Bully Dog, LML, and more Regenerations

Guys,
I'm new to the forum and need a little help. I recently added a Bully Dog Triple Dog GT to my 2011 Duramax. Since adding it I am experencing way more regenerations than I was getting stock. Before the tuner I was about 1 regen per tank. Now I am experiencing a regen about every 100-125 miles (about 4-5 times per tank). I am not running the truck hard, just normal driving. What would be causing this? Anyone else having this problem with this set up? Is this going to damage the truck over time? I have contacted Bully Dog but can't seem to get any real answers. Any help would be greatly appreciated. Thanks.

Share

Offline

04-11-2011, 09:37 PM #2 (permalink)

falcontech
Diesel Fanatic

Join Date: Sep 2010
Location: Atlanta, GA
Posts: 59

View Photos By: falcontech

iTrader Score: 0 reviews

I had the bullydog tuner for a few months until H&S released their tunner. I experienced the same thing, had about 3 or 4 regens per tank. The more city and driving I did and the more i abused the truck the more it went into regen. From what I have learned this is normal. The tune is essentally burning more fuel for more power which makes more soot that the DPF Filer needs to clean, therefore more regens. The only way to get around this is call H&S and remove the DPF. You will be

Share

Offline

Quote

04-11-2011, 11:32 PM #3 (permalink)

cstarnes
Diesel Head

Join Date: Jun 2006
Posts: 25
iTrader Score: 0 reviews

How do you know your truck is going into REGEN?

Share

Offline

Quote

04-12-2011, 12:03 AM #4 (permalink)

falcontech
Diesel Fanatic

Join Date: Sep 2010
Location: Atlanta, GA
Posts: 59

View Photos By: falcontech

iTrader Score: 0 reviews

the easiest way is the elevated idle 640 rpm up to 800 rpm during regen. If you are able to read egt you will see them up about 200.

Share

Offline

Quote

04-12-2011, 02:16 PM #5 (permalink)

Dirtymax81
Diesel Technician

Join Date: Jun 2007
Location: BFE
Posts: 461
iTrader Score: 0 reviews

4-5 regens at every 100-125 miles means you are getting 400+ miles per tank of fuel?

Share

2005 LLY-
PPE hot+2
4" Turbo back
AFE CAI

Offline

Quote

04-12-2011, 08:21 PM #6 (permalink)

20Duramax11
Diesel Enthusiast

Join Date: Dec 2010
Posts: 5
iTrader Score: 0 reviews

Offline

Yes. 36 gallon tank. I'm getting 530+ miles per tank right now. I do like the power gain. Just not to impressed with the constant regeneration cycles. I just hope it doesn't have any long term effects on the truck. The way i'm thinking about it is like this: At 100,000 miles with the tuner, the truck will have regenerated as many times as it would at 400,0000 miles without the tuner (before I was regenerating 1 time per tank on average)
. I just wish Bully Dog would have disclosed this information before I spent $700.

Share

Quote

04-13-2011, 02:12 AM #7 (permalink)

Bartman432
Diesel Pro
PREMIUM MEMBER

Join Date: Jun 2007
Location: Upland, California
Posts: 2,290

View Photos By: Bartman432

iTrader Score: 0 reviews

Offline

Ouch, 4-5 regens per tank. I hate having the regen just once per tank.

Share

_____
Bought new: 2015 GMC Sierra Denali, 2WD, 5.3, all options. 2" Bell Tech drop shackles, MGP caliper covers, JL Audio 10" shallow mount sub 10TW3-D4 & JL Audio mono amp XD600/1v2
Sold: 2007.5 Chevy Silverado 2500 HD D-Max
USMC Vet, 1988-1992, 3rd AABN YAT YAS

Quote

04-13-2011, 02:38 AM #8 (permalink)

8100 Power
Diesel Master

Join Date: Nov 2004
Location: Middle-TN
Posts: 3,364

View Photos By: 8100 Power

iTrader Score: 0 reviews

TN Diesel Place Club Member

Offline

Wheres BullydogJason at? Maybe he could help out with answers.

Share

_____
DURAMAX

Quote

04-13-2011, 01:39 PM #9 (permalink)

Dirtymax81
Diesel Technician

Join Date: Jun 2007
Location: BFE
Posts: 461
iTrader Score: 0 reviews

Offline

Only truck ive had experience with is a stock 2011 with the GT, it does a regen about 1 per tank on the performance tune, that is with majority of highway driving, maybe 75/25

do you have the 1128 software?

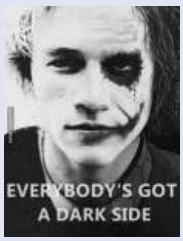
Share

_____
2005 LLY-
PPE hot+2
4" Turbo back
AFE CAI

Quote

04-13-2011, 02:42 PM #10 (permalink)

DIESELMAFIALB7
Diesel Specialist



Join Date: Oct 2008
Location: ID
Posts: 777

View Photos By: DIESELMAFIALB7

iTrader Score: 1 reviews

Idaho Turbo Diesels Member

Offline

You probalby be happy going with the h&s to or just see if you can ge ride of your constant regen with the bully dog

Share

_____
2003 GMC Sierra LB7 CC/SB best 1/4 12.17@113.24
Diesel Mafia performance turning(by me), PPE, EPR, ARP, FASS,Ect.....more in the works

> Quote:
> Originally Posted by **Mike_S;**
> *(efi live) Some Computer Laptop Cable Adapter Thingy I Don't Understand....*

Why So Serious?

Quote

Post Reply

You May Like

How Millions Of Americans Have Cut Years Off Credit Card Payments

LendingTree

Brilliant Mortgage Payoff Method Has Banks On Edge

Comparisons.org

Get Grandfathered In For Extra Social Security By April 30th

Stansberry Research

Homeowners Are in for a Big Surprise in 2016

AmeriValue Rate Quotes

Quick Reply

Message:

Options

Quote message in reply?

Human Verification

In order to verify that you are a human and not a spam bot, please enter the answer into the following box below based on the instructions contained in the graphic.

Post Quick Reply | Go Advanced

« Previous Thread | Next Thread »

Posting Rules

You **may** post new threads
You **may** post replies
You **may not** post attachments
You **may not** edit your posts

BB code is **On**
Smilies are **On**
[IMG] code is **On**
HTML code is **Off**
Trackbacks are **On**
Pingbacks are **On**
Refbacks are **On**

Forum Rules

Similar Threads

Thread	Thread Starter	Forum	Replies	Last Post
From Bully Dog to PPE	99blackz	Third Generation Duramax Electronics/Tuners	25	05-18-2009 06:29 PM
Bully Dog PMT	Soundsgreat	Medium Duty Trucks	6	02-24-2009 07:01 AM
Bully Dog	blk2dmax	Closed / Archived Marketplace Ads	0	02-03-2009 04:15 PM
PPE or Bully Dog PMT	ML2500	Third Generation Duramax Electronics/Tuners	13	11-16-2008 03:52 PM
bully dog	sjsperdute	Allison OEM	6	10-27-2005 01:34 PM

All times are GMT -4. The time now is 10:08 PM.

Notices

*****Reminder, Februarys Entry Is Up*****

The Diesel Place, Billet License Plate Frame Give Away.

Fifth Generation Duramax Electronics/Tuners Discuss **2011+ LML** Duramax engine electronic upgrades including chips, tuners, programmers, etc.

10-13-2011, 12:19 AM #11 (permalink)

jimmyjo64
Diesel Head

Join Date: Aug 2007
Location: CONROE,TEXAS
Posts: 42
iTrader Score: 0 reviews

my seem to regen all the time and i dont have a tunner I HATE THIS REGEN CRAP 100K MI ITS COMMING OFF.

Share

Offline

Quote

11-21-2011, 04:34 PM #12 (permalink)

salmandmx
Diesel Master

Join Date: Feb 2007
Location: N. Little Rock, Arkansas
Posts: 1,028

View Photos By: salmandmx

iTrader Score: 0 reviews

I am assuming that all the extra regens is because the truck is in the highest power setting? If its in the lowest one, I assume the regens will be alot less frequent. I am wanting to buy one but if its gona regen every 100-125 miles.. No thanks!

Share

_____
2011 2500HD Denali Duramax 4x4 Crew Cab
4" Cognito Lift - Fox Shocks
35x12.50R 20 - BMF Novakane 8s

Offline

Quote

12-01-2011, 06:27 PM #13 (permalink)

Blackcloud556
Alligator Diesel Performance / Click here for info!
Diesel Technician

Join Date: Sep 2011
Location: Coeur D'Alene Idaho
Posts: 321
iTrader Score: 0 reviews

Quote:

> Originally Posted by **falcontech**
> *The more city and driving I did and the more i abused the truck the more it went into regen. From what I have learned this is normal. The tune is essentially burning more fuel for more power which makes more soot that the DPF Filer needs to clean, therefore more regens. The only way to get around this is call H&S and remove the DPF. You will be*

This is exactly whats happening. You up the power, it creates more exhaust and soot which then clogs up the dpf faster. its the price you gotta pay if you want to keep the DPF and have a tuner on your truck.

Quote:

> Originally Posted by **8100 Power**
> *Wheres BullydogJason at? Maybe he could help out with answers.*

Im right here.. I no longer work for Bully Dog.

Share

_____
http://www.duramaxforum.com/forum/si...ic37951_16.gif
Jason. 06 LBZ. 208-777-1977
Alligator Performance | Facebook
Blackcloud Photography

Offline

Quote

09-30-2014, 08:10 AM #14 (permalink)

in4it
Diesel Rookie

Join Date: Sep 2014
Posts: 39
iTrader Score: 0 reviews

Offline

This is not a Bully Dog or H&S issue. It is a GM issue and it got passed down to the unaware consumer.

GM is doing nothing about it.

They are not warranting my truck for constant regeneration issues after 2 years of suffer with this problem. The mechanics do not know what the issue could be from. Differential pressure sensor was replaced in Aug 2014. EGR valves were checked and reinstalled and then GM cut off the warranty on my truck. They said that the ECM was updated 6 times. They cannot tell me when, who, or what was modified from stock. I told them if I have a open check book and I paid for the $1000 ECM and installation would it solve the problem? The answer: " I don't know. But, I would start there."

GM has done nothing to solve the problem for 2 years. My 2012 truck is still stock and now has 44K miles.

Regeneration happen every 100-125 mile.

They were happening every 60-80 miles.

Share

Last edited by in4it; 09-30-2014 at 08:13 AM.

Quote

09-30-2014, 01:53 PM #15 (permalink)

NorCal2500HD
Diesel Head

Join Date: Dec 2005
Posts: 560
iTrader Score: 0 reviews

Offline

The two should be separated because yes, canned tuners are known to run dirty and can cause more frequent regens. THis was the case before EFI live came onto the scene for the LML providing much cleaner tunes

Similarly there are a lot of guys with bone stock trucks experiencing the same phenomenon including myself. However for us its not clear if its the result of a dirty running stock truck or something else.

Share

Quote

09-30-2014, 02:04 PM #16 (permalink)

in4it
Diesel Rookie

Join Date: Sep 2014
Posts: 39
iTrader Score: 0 reviews

Offline

Quote:

> Originally Posted by **NorCal2500HD**
> *The two should be separated because yes, canned tuners are known to run dirty and can cause more frequent regens. THis was the case before EFI live came onto the scene for the LML providing much cleaner tunes*
>
> *Similarly there are a lot of guys with bone stock trucks experiencing the same phenomenon including myself. However for us its not clear if its the result of a dirty running stock truck or something else.*

What do you think could be creating the issue of constant regenerations?

Rumor on my end could be a faulty injector, or, bad software.

If there was a bad injector installed in the downpipe in 2011 and there was not a recall and that was found to be the problem, then that should be the first thing replaced and there should be a GM bulletin for it. I think there was something in April 2012 if memory serves me.

If it not an injector, then the software has to be the problem.

Share

Last edited by in4it; 09-30-2014 at 02:05 PM.

Quote

09-30-2014, 06:00 PM #17 (permalink)

NorCal2500HD
Diesel Head

Join Date: Dec 2005
Posts: 560
iTrader Score: 0 reviews

Offline

I wish I knew...

What I do know is 1) GM techs are clueless on how to resolve this and 2) GM corporate likely knows what's going on with these trucks and due to the cost to repair is turning a blind eye on its customers. I have a hard time believing GM corporate engineers don't have a clue what is causing this.

Share

Quote

10-23-2014, 08:57 AM #18 (permalink)

in4it
Diesel Rookie

Join Date: Sep 2014
Posts: 39
iTrader Score: 0 reviews

Offline

I called the Service Manager from the original dealer. Brand Quality and the dealer are putting something on the truck to monitor the vehicle and they want me to drive it around to get additional information from the vehicle. One thing I have noticed after installing the stock intake, it seems as thought the truck is relearning to readapt to the change in the intake systems.
I am back to 200 miles between regenerations. This is where I was prior to pulling the stock intake out. I did not really notice a vehicle performance change other than sluggish take off. Slow on the gas pedal reaction and mileage sucks. Maybe a little higher differential pressure from the CTS.
The last regeneration ended yesterday morning when I pulled in the parking lot at work. RPMs were still high when I shut down the truck. I was at 0g when I pulled in the parking space. Prior to me shutting off the vehicle within a minute of arrival soot level climbed to 9g on the CTS. I left work drove approx. 15 miles to the dealer I ended up with 12g of soot which is where it is at right now. I should be picking it up tonight.
A huge white cloud still bellows out of the tail pipe at the beginning of the regeneration. If I shut down the system and let it cool and start it back up hours later. It does the same thing as the temps start to get back to soot burn levels.

Share

Quote

Post Reply

How Millions Of Americans Have Cut Years Off Credit Card Payments

LendingTree

Brilliant Mortgage Payoff Method Has Banks On Edge

Comparisons.org

Get Grandfathered In For Extra Social Security By April 30th

Stansberry Research

Homeowners Are in for a Big Surprise in 2016

AmeriValue Rate Quotes

Quick Reply

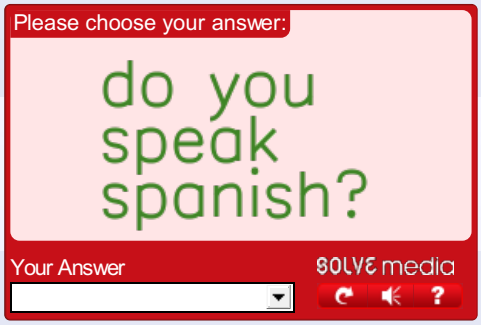
Message:

Options

Quote message in reply?

Human Verification

In order to verify that you are a human and not a spam bot, please enter the answer into the following box below based on the instructions contained in the graphic.



Post Quick Reply | Go Advanced

« Previous Thread | Next Thread »

Posting Rules

You **may** post new threads
You **may** post replies
You **may not** post attachments
You **may not** edit your posts

BB code is **On**
Smilies are **On**
[IMG] code is **On**
HTML code is **Off**
Trackbacks are **On**
Pingbacks are **On**
Refbacks are **On**

Forum Rules

Similar Threads

Thread	Thread Starter	Forum	Replies	Last Post
From Bully Dog to PPE	99blackz	Third Generation Duramax Electronics/Tuners	25	05-18-2009 06:29 PM
Bully Dog PMT	Soundsgreat	Medium Duty Trucks	6	02-24-2009 07:01 AM
Bully Dog	blk2dmax	Closed / Archived Marketplace Ads	0	02-03-2009 04:15 PM
PPE or Bully Dog PMT	ML2500	Third Generation Duramax Electronics/Tuners	13	11-16-2008 03:52 PM
bully dog	sjsperdute	Allison OEM	6	10-27-2005 01:34 PM

All times are GMT -4. The time now is 10:09 PM.

Dodge

Will an aftermarket tuner cause the DPF to clog up?

Resolved Question:

Will an aftermarket tuner cause the DPF to clog up?

Expert: Ric

Ric :
Welcome to Just Answer...My name is XXXXX XXXXX i'm here to help you today.

Ric :
Yes and no they can depending on the tune that you want to run in your truck.Most companies have pretty compatible tunes for your truck.You might want to check with the dealer you take your truck to the most to see if using one of these might affect you emissions warranty.

Customer:
i have been using a bullydog triple dog set to extreme. The EGR and DPF clogged up pretty good and the mechanic i took it to said that could be the cause.

Ric :
Yep that will do it.

Ric :
The extreme setting runs more fuel thru the system the the emissions system has time to clean up.

Customer:
ok, on a similar note... what can i do in the future to keep things running clean? I will obviously remove the tuner and use it only for gauges. I've heard running with the exhaust brake on all the time will help, also "drive it like you stole it".

Ric :
You could talk to the place where you bought your tuner or to anybody who uses the triple dog setup. The best place for good info would be to contact the bullydog company.I've dealt with them before and they are good and helpful.contd....

Ric :
You can drive the truck with the exhaust brake on all the time as long as you are not annoyed wtih the noise.Using the exhaust brake more often does help keep the turbo slider clean.

Customer:
what can i do to keep the dpf clean? Do you have a tuner you recommend?

Ric :
Most of my customers do use the bullydog setup in the economy setting.To help keep the dpf clean you would need to drive the truck on the highway at about 55 to 65 mph and stay steady at that speed for about 20 to 30 miles occasionally to help burn off the soot build-up.Also about every 3rd oil change use a fuel additve that helps raise the BTU's of the fuel to help keep everything clean internally.

Customer:
would that be the tow setting? what additive would you suggest, seafoam?

Ric :
Yes..The additive i suggest is Kleen or Power service.You can get these at any parts store.

Customer:
ok, i'll look for one of those. is there any benefit to driving the truck hard? I don't tow, so im not sure if my daily driving would put enough load on the engine...

Ric :
The benefit of driving the truck harder is to help heating up the emissions system and the turbo slider clean.does you bullydog have the mobile desoot feature on it?

Customer:
ok, i'll start doing that. My bullydog does have the mobile desoot feature

Ric :
Big Note: the particulate filter is designed to hold only so much of the burnt off soot...so if the system is run "dirty" so to speak too long the dpf can become clogged with the ash leavings and need replacing.

Customer:
any way to eject the leavings from the dpf?

Ric :
Be sure to check for updates for your tuner occasionally

Customer:
absolutely

Ric :
You can try by removing the dpf and using compressed air to blow it out. Works about 70/30% of the time.

Ric :
You can also do this to the other 2 convertors if they get soot fouled.Dodge sell a solution that works good for cleaning the egr system and soot deposits.

Ric :
Can i help you with anything else?

Customer:
so there is no way to blow it out, it must be serviced?

Ric :
The soot or the ash?

Customer:
the ash

Ric :
Unfortunately the only way to try to get the ash out of a full dpf is to remove it and blow out as much ash as possible.Stand the dpf up on its end and use compressed air the flip it over and do it again.

Ric :
whoops...then not the....sorry

Customer:
what a pain. Thanks for your help!

Ric :
No problem.If you need anythig else just look up this chat and ask.

Ric, ASE Certified Technician
Category: Dodge
Satisfied Customers: 150
Experience: ase certified/certified chrysler/dodge specialist/30 years

Ric and 3 other Dodge Specialists are ready to help you

Expert: Ric

Greetings..Ric from JustAnswer here.If you found my assistnace helpful...please dont hesitate to look me up here most anytime.Thank you again...

Ask Your Own Dodge Question

Share this conversation

Ask Ric Your Own Question

Ric, ASE Certified Technician
Category: Dodge
Satisfied Customers: 150
Experience: ase certified/certified chrysler/dodge specialist/30 years

Type Your Dodge Question Here...

Ric is online now

Get an Answer

08-21-2013, 07:46 PM eBay Motors #1 (permalink)

briankinley2004
Junior Member

Join Date: Aug 2013
Location: Louisiana
Posts: 202

Plugged DPF with Bully Dog tuner

First post here and hope I put this in the right place. I own a 2008 2500HD 4WD with a Duramax. It has 145,000 miles on it. At about the 30,000 mile mark I had a Bully Dog gauge tuner installed to get my speedometer right with some oversized tires that I put on. I don't really hot rod and tow maybe once a month. I have always run the tuner in "extreme" mode except when towing. So I have put over 100K miles on the vehicle with the tuner, gotten better mileage and zero issues.

Couple weeks ago on the way home from a long trip I started getting the "clean exhaust filter" and reduced power mode. I had only gotten this once before several months ago. I was on a 6HR trip and about an hour from home it finally quit completely stranding me. I had it towed to a dealer. They diagnosed it as a "plugged exhaust filter due to an aftermarket tuner". They charged me 2grand material and labor. I talked to the mechanic on the side and he said the tuners cause them to plug up more often but they do it anyway. He said if I got over 100K miles I should make that again without issues.

Well the following week I made the same 6Hr journey. I had less than 1000 miles on the new filter and had towed nothing. Started getting these same issues again and 2 hr from home it quit again. Towed to a different dealer this time as I was in a different area. This dealer said it was "plugged exhaust filter due to aftermarket tuner". They said the new filter plugged up because I had tuner on. I told them I was not paying 2 grand again as I was quoted this amount to bypass it. So they left a gap between the exhaust filter and pipe so I could drive it home.

I got it to the Bully Dog guy. He said he couldn't believe it plugged up that fast. He actually cleaned the filter, updated the software and forced a burnoff. Spent over 3 hrs and didn't charge me a penny. He said to run it in tow mode a while and do 3 or 4 manual burn offs when I was running for 20 min or so. He then said to just run in performance mode not extreme. He had no suggestions as to why it would plug up again so soon.

I am leaving tomorrow night on the same journey. I now know I can use a 15mm wrench and crack this thing open to get out of a bind. My question is does anyone know why the new filter would have plugged up so soon? Is it possible there was residue in the exhaust from the initial removal that got caught in it or should I expect this to happen again soon. I just find it hard to blame the tuner when I put 110K miles on with it with zero issues. My driving habits haven't changed. I appreciate any input!

08-21-2013, 07:50 PM — eBay Motors #2 (permalink)

dmaxblack3
Senior Member

Join Date: Jan 2012
Posts: 582

Best thin to do would be get efi live and delete the dpf and your truck would run so much better! Good luck

Sent from AutoGuide.com App

_____

2008 2500hd duramax-5% tint all around-22x10 Recon SS American Force wrappend with 305/45/22 nitto 420s-edge cts insight-EFI'd-10 in kickers-kicker amp-alpine navigation-egr delete- 4 in turbo back- turbo res plugged- 8000k hids hi lo DMAXSTORE.com Your Duramax Diesel-Only Shopping Resource

QUOTE

08-21-2013, 07:52 PM — eBay Motors #3 (permalink)

briankinley2004
Junior Member

Join Date: Aug 2013
Location: Louisiana
Posts: 202

Thanks Dmax that's my plan but since I just spent 2 grand on the new filter I am going to try to milk it a while first. That is if it doesn't plug up again. Any idea on the cost of these alterations. I was quoted 2200 from a local shop but I didn't ask what brand delete chip

QUOTE

08-22-2013, 11:42 AM — eBay Motors #4 (permalink)

dmaxblack3
Senior Member

Join Date: Jan 2012
Posts: 582

All depends on what tuner you go with and it's all custom. I went with mark from danville performance and I love it. You'll just have to do some research on here and check out all the vendors and they'll get you hooked up!!

Sent from AutoGuide.com App

_____

2008 2500hd duramax-5% tint all around-22x10 Recon SS American Force wrappend with 305/45/22 nitto 420s-edge cts insight-EFI'd-10 in kickers-kicker amp-alpine navigation-egr delete- 4 in turbo back- turbo res plugged- 8000k hids hi lo DMAXSTORE.com Your Duramax Diesel-Only Shopping Resource

QUOTE

08-22-2013, 11:59 AM — eBay Motors #5 (permalink)

Goose2448
DuramaxForum Fanatic

Join Date: Jan 2013
Location: TEXAS/Bokeelia, FL from Hanover, PA
Posts: 8,321

You probably have an EGR problem. EFI from a good tuner with am exhaust and blocker plate will take care of the plugged DPF issues and cost half as much for what you paid for the new DPF.

SENT THROUGH MY DURAMAX'S BUNG HOLE

2008 GMC 3500HD CC LB DRW 4x4~Westin Step Bars, WeatherTech Floor Liners, Antenna "Delete", Plasti Dipped Grill and Emblems and Rims, Leveled, Funky Gear Rims, Nictane Adapter with Donaldson and Clear Bowl, 3" Magna Flow Down Pipe, 5" Diamond Eye Exhaust Dumped, EFI By Kory, Crobra 29LTD WX/BT/NW CB, Dual 4' Firesticks, Recon Roof Lights, Reese Pro Series 15K 5th Wheel Hitch

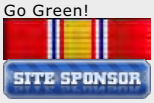
1985 Chevy C20 RCLB 350 4 Bolt, 4 Barrel Carb, 4.10 Gears, 8600 GVW, Glass Packs Dumped, Pig Skin Leather, Bed Mounted 5th Wheel, Dual 20 gal Tanks, 62,146 Miles, Indian Bronze and Cream~Rolled

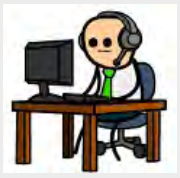
DF DRW Club Member 129

Goose's Build Thread Thingy

08-22-2013, 12:37 PM — eBay Motors #6 (permalink)

Blackcloud556
Go Green!





Join Date: Jun 2010
Location: Coeur D'Alene Idaho
Posts: 5,938

tuned or not the dpf will eventually plug up, the tuner just helps to speed up the process. Its one of the unfortunate side effects that you ultimately have to deal with if you wish to leave your emissions systems in tact. Id either return it to stock to slow down the process or upgrade to a different tuner and delete the emissions systems completely.

08-22-2013, 01:44 PM — eBay Motors #7 (permalink)

jc1843
Super Moderator

Join Date: Jun 2008
Location: So. Cal
Posts: 14,023

Moved to LMM

Chevy 04.5 LLY, 2X, shell, XDR, MikeL Heavy duty up-grade, 6spd, TransGo, deep pan, de-badged, 65 Gallon replacement Aero tank, LBZ-mp, Kennedy pump, shimmed, Pre-fuel filter, tow mirrors, BU cam, gauges, GPS, Sirius, bags, custom grille, fender vents, HD trans cooler- Curt front hitch, footwell lights, load lights, Studs, head gaskets.---Jerry

08-27-2013, 08:20 PM — eBay Motors #8 (permalink)

briankinley2004
Junior Member

Join Date: Aug 2013
Location: Louisiana
Posts: 202

Well I made the trip again with no issues running in performance mode and tow mode coming home towing a trailer. I don't understand why it clogged up one week after being replaced but once it was cleaned I haven't had an issue again. Could there have been residual stuff in the pipe? Goose how would I diagnose an EGR problem. Apparently 2 dealers didn't find it

09-02-2013, 07:38 PM — eBay Motors #9 (permalink)

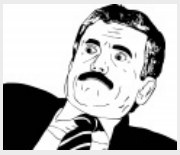
briankinley2004
Junior Member

Join Date: Aug 2013
Location: Louisiana
Posts: 202

Well it plugged up again on the way home from the weekend. I cracked the exhaust open at the dpf filter to relieve the pressure and make it home. I want to bypass this thing but if there are other issues going on I want to correct them and not just treat the symptoms. My friend who is a Ford mechanic mentioned EGR also and said they have issues with anti freeze getting into the exhaust and clogging the filter. He was unsure on Duramax. Does anyone have any idea why this thing keeps plugging up even though its only a few weeks old??

09-05-2013, 03:00 PM — eBay Motors #10 (permalink)

HD Dmax Machine
DuramaxForum Guru



Join Date: May 2011
Location: Nomad
Posts: 11,320

Dont use the tuner with the DPF still intact. This is why your DPF keeps getting plugged up.

My truck had this EGR valve problem early on. All that the dealer would do was clean the EGR valve. On the last vist to a dealer cause of the EGR valve a service writer said the LMMs are noted for EGR valve problems. He said that they came out with a software update to fix some EGR valve (related problems) in 08.

Best thing you can do is DOC, DPF delete, EGR turned off/unplugged/EGR blocker plate.

DURAMAX DIESEL
2009 GMC 2500HD SLE CC/SB 4x4 LMM
EFI Live, Edge Insight CTS, Flo~Pro 4" DP back exhaust w/muffler & stock trumpet tip, EGR disabled, Resonator delete plug, Alum. bleeder screw, WIF sensor delete plug, Fumoto oil drain valve, Pacer LED cab lights, GM dually light bar under tailgate, Footwell lights, Cobra 29 WXNWST CB radio, Wilson 2000 CB antenna, Kenwood speakers, GM chrome oval running boards, Bilstein 5100s, Michelin M/S2 on PY0 wheels, Rubber mud flaps, Curt class IV hitch

Last edited by HD Dmax Machine; 09-05-2013 at 03:03 PM.

Gear in this thread - Powered by O'Reilly Auto Parts

Edelbrock Pro-Flo - Air Cleaner Assembly

Air Cleaner Assembly - Pro-Flo; Chrome Air Cleaner

>> More on Edelbrock Pro-Flo - Air Cleaner Assembly

Mechanix Wear - Thermal Dip Hi-Viz Winter Glove

Thermal Dip Hi-Viz Winter Glove - Thermal Dip Hi-Viz; Large/X-Large

>> More on Mechanix Wear - Thermal Dip Hi-Viz Winter Glove

Hopkins Manufacturing SubZero - Auto Emergency Shovel

Auto Emergency Shovel -

>> More on Hopkins Manufacturing SubZero - Auto Emergency Shovel

You May Like

The Most Outrageous, Amazing, Perfectly Timed Pictures You'll Ever See
All Perfectly Timed

15 Adorable Mommy Instagrams
Parent Society

10 Best Celebrity Pranks of All Time
OldCatLady

Dogs That Don't Look Like Dogs
Wowticles

Quick Reply

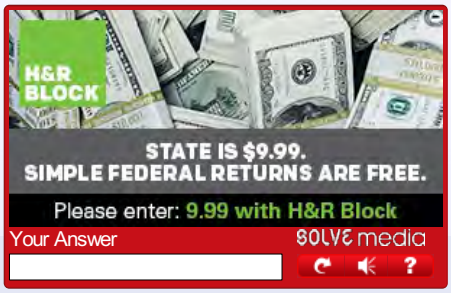
Message:

Options

Quote message in reply?

Human Verification

In order to verify that you are a human and not a spam bot, please enter the answer into the following box below based on the instructions contained in the graphic.



Post Quick Reply | Go Advanced

« H&s & efi | Recon lights broke »

Posting Rules

You **may** post new threads
You **may** post replies
You **may not** post attachments
You **may not** edit your posts

BB code is **On**
Smilies are **On**
[IMG] code is **On**
HTML code is **Off**
Trackbacks are **On**
Pingbacks are **On**
Refbacks are **On**

Forum Rules

All times are GMT -7. The time now is 09:51 PM.

Google™ Custom Search

post #1 of 15 (permalink) 06-17-2011, 08:13 PM Thread Starter

newdmaxguy
Junior Member

Join Date: Dec 2010
Posts: 222

Bully Dog GT tuner questions

I was told that the bulldog GT tuner could be installed and if needed could be removed if the truck was to be taken to the dealer to have work done. Anyone know if this is true ? The person telling me about itsId he talked with a guy who had one on an 11 LML and was getting 22+mpg while in the economy setting. Anyone out there with a GT tuner or anyone who knows about them out there? Would love more information on them.

2011 LML CCSB Z71 4x4 20" factories. H&S Mini Max, AirDog II, 4" Flow Pro with muffler, MBRP down pipe, PCV reroute.

Quote Quick Reply

post #2 of 15 (permalink) 06-17-2011, 08:43 PM

jkf
DuramaxForum Veteran

Join Date: Feb 2010
Location: Mile high AZ
Posts: 1,018

Um, I don't know for sure, but I really doubt a bully dog tuner is gonna getcha 22mpg. Most folks on here that have had a bully dog don't have much good to say about them, I had one, it was ok...
And most of the canned tuners are removeable, if they are installed thru the OBD port, but on the LMM, the dealer will be able to see tha it's been tuned with an aftermarket device.

2006 GMC Sierra CCLB 2500HD
EFIlive, DSP5, EGR blocked, Magna-flow downpipe, MBRP 5" turbo-back, aFe pro-guard7
Lifetime LED headlights, all on mod, H2 wheels, ride-rite air bags, bed liner,
Truck Cover USA, EBC rotors & pads, tie rods sleeved.

Wants 4049vvt, built tranny

NEEDS: TRAIN HORNS!!!

Quote Quick Reply

post #3 of 15 (permalink) 06-18-2011, 03:13 PM

DENALI HD3500
DuramaxForum Veteran

Join Date: Feb 2011
Posts: 1,294

Quote:
Originally Posted by **newdmaxguy**

> *I was told that the bulldog GT tuner could be installed and if needed could be removed if the truck was to be taken to the dealer to have work done. Anyone know if this is true ? The person telling me about itsId he talked with a guy who had one on an 11 LML and was getting 22+mpg while in the economy setting. Anyone out there with a GT tuner or anyone who knows about them out there? Would love more information on them.*

Bully Dog has no tune for the LML yet. Waste of time useing a tuner without doing full deletes anyway. Your mileage will drop if anything useing a tuner with DPF intact due to the more frequent regen needed from added fuel of the tuner. Bully Dog is really not a good tuner for the DMAX anyway.

2015 SLT CCSB Summit White on Jet Black sunroof/rear slider/driver alert/ cooled/heated leather/nav/ telescope/tilt steer... Z71 package .

Previous:2002 LB7 ECSB
2005 LLY CCSB
2007.5 LMM CCSB
2010 CTD CCSB
2011 LML CCSB

Quote Quick Reply

post #4 of 15 (permalink) 06-18-2011, 08:16 PM

Blackcloud556
Go Green!

Join Date: Jun 2010
Location: Coeur D'Alene Idaho
Posts: 5,938

Quote:
Originally Posted by **DENALI HD3500**

> *Bully Dog has no tune for the LML yet. Waste of time useing a tuner without doing full deletes anyway. Your mileage will drop if anything useing a tuner with DPF intact due to the more frequent regen needed from added fuel of the tuner. Bully Dog is really not a good tuner for the DMAX anyway.*

we dont huh?

last i checked we were the first ones to release, and other then H&S the ONLY ones to release for the LML. so cool story bro.

anyways. yes, remove your tune from your truck before you go to the dealer.. if they flash you. we have a $100 charge to reset your tuner.

Quote Quick Reply

post #5 of 15 (permalink) 06-19-2011, 03:50 PM Thread Starter

newdmaxguy
Junior Member

Join Date: Dec 2010
Posts: 222

So have you installed any of these ? the $100 if they flash ? meaning that I can take it back to dealership, with tuner removed and they will not know that I have had the tuner on it ? and if they reflash then it will be another $100 to put the tuner back on the truck ?

2011 LML CCSB Z71 4x4 20" factories. H&S Mini Max, AirDog II, 4" Flow Pro with muffler, MBRP down pipe, PCV reroute.

Quote Quick Reply

post #6 of 15 (permalink) 06-19-2011, 06:47 PM

DENALI HD3500
DuramaxForum Veteran

Join Date: Feb 2011
Posts: 1,294

Quote:
Originally Posted by **BullyDogJason**

> *we dont huh?*
>
> *last i checked we were the first ones to release, and other then H&S the ONLY ones to release for the LML. so cool story bro.*
>
> *anyways. yes, remove your tune from your truck before you go to the dealer.. if they flash you. we have a $100 charge to reset your tuner.*

Hmmm. Do you have DPF/DEF delete program(off road) and what are the HP and torque gains with full deletes?. Any way with emmisions in tact still useless for any real gains. $100 for a reflash??? Why the extra cost?? Bully Dog(any programmer) is detectable by dealer and can pose a threat to your drivetrain warranty, period.

2015 SLT CCSB Summit White on Jet Black sunroof/rear slider/driver alert/ cooled/heated leather/nav/ telescope/tilt steer... Z71 package .

Previous:2002 LB7 ECSB
2005 LLY CCSB
2007.5 LMM CCSB
2010 CTD CCSB
2011 LML CCSB

Quote | Quick Reply

post #7 of 15 (permalink) 06-21-2011, 08:20 AM

Blackcloud556
Go Green!

Join Date: Jun 2010
Location: Coeur D'Alene Idaho
Posts: 5,938

Quote:
Originally Posted by **newdmaxguy**

> *So have you installed any of these ? the $100 if they flash ? meaning that I can take it back to dealership, with tuner removed and they will not know that I have had the tuner on it ? and if they reflash then it will be another $100 to put the tuner back on the truck ?*

ive installed several.

If your truck gets flashed at the dealer and you did not return your truck to stock first we have a $100 fee to unlock your unit.

yes the dealer can tell if you have installed a tuner or not. It is your responsibility to determine with your dealer if they will void your warranty or not.

Quote Quick Reply

post #8 of 15 (permalink) 06-21-2011, 08:24 AM

Blackcloud556
Go Green!

SITE SPONSOR

Join Date: Jun 2010
Location: Coeur D'Alene Idaho
Posts: 5,938

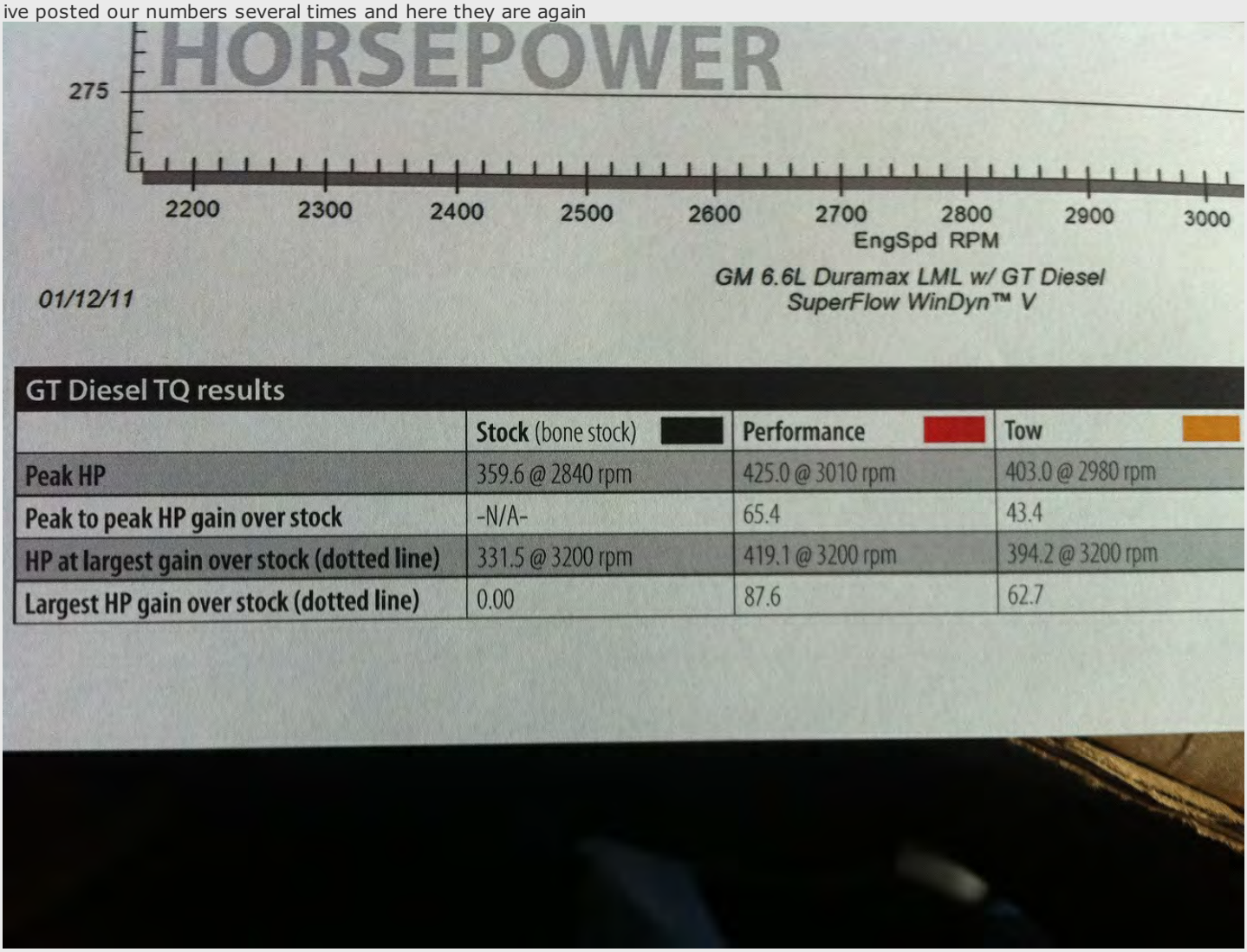
Quote:
Originally Posted by **DENALI HD3500**

> *Hmmm. Do you have DPF/DEF delete program(off road) and what are the HP and torque gains with full deletes?. Any way with emmisions in tact still useless for any real gains. $100 for a reflash??? Why the extra cost?? Bully Dog(any programmer) is detectable by dealer and can pose a threat to your drivetrain warranty, period.*

No we do not do dpf deletes, if you want that go buy an H&S. You have to remember that not everybody wants to remove their emissions equipment.

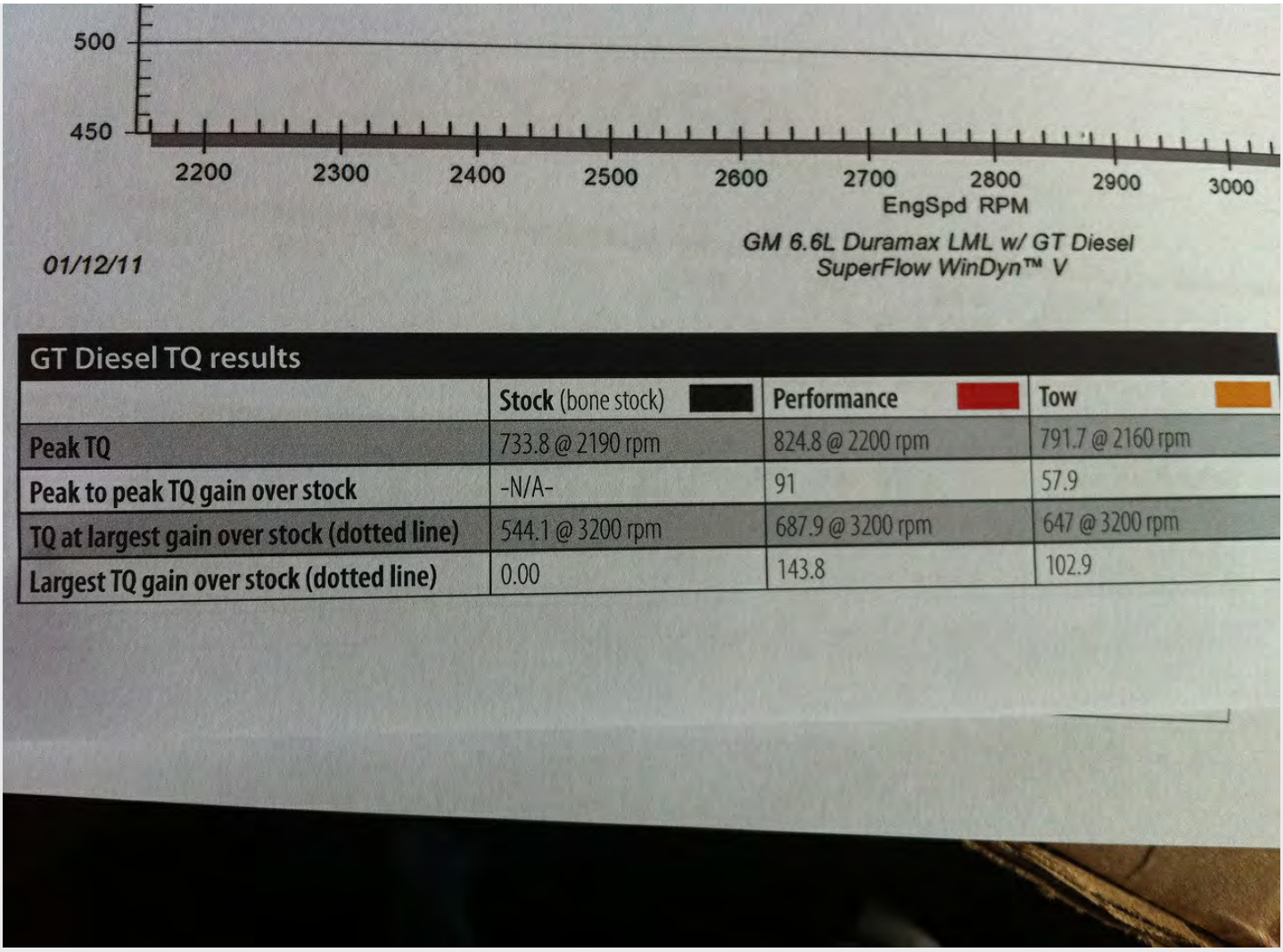
if you want hp numbers with deletes go check out H&S's website

ive posted our numbers several times and here they are again



GT Diesel TQ results

	Stock (bone stock)	Performance	Tow
Peak HP	359.6 @ 2840 rpm	425.0 @ 3010 rpm	403.0 @ 2980 rpm
Peak to peak HP gain over stock	-N/A-	65.4	43.4
HP at largest gain over stock (dotted line)	331.5 @ 3200 rpm	419.1 @ 3200 rpm	394.2 @ 3200 rpm
Largest HP gain over stock (dotted line)	0.00	87.6	62.7



GT Diesel TQ results

	Stock (bone stock)	Performance	Tow
Peak TQ	733.8 @ 2190 rpm	824.8 @ 2200 rpm	791.7 @ 2160 rpm
Peak to peak TQ gain over stock	-N/A-	91	57.9
TQ at largest gain over stock (dotted line)	544.1 @ 3200 rpm	687.9 @ 3200 rpm	647 @ 3200 rpm
Largest TQ gain over stock (dotted line)	0.00	143.8	102.9

the $100 fee is only if YOU the consumer do not return your truck to stock, and your truck is flashed by the dealer... As long as you remove your tune from your truck there is no additional fees.

Quote Quick Reply

post #9 of 15 (permalink) 06-21-2011, 08:43 AM

DENALI HD3500
DuramaxForum Veteran

Join Date: Feb 2011
Posts: 1,294

Thanks for the info.

2015 SLT CCSB Summit White on Jet Black sunroof/rear slider/driver alert/ cooled/heated leather/nav/ telescope/tilt steer... Z71 package .

Previous:2002 LB7 ECSB
2005 LLY CCSB
2007.5 LMM CCSB
2010 CTD CCSB
2011 LML CCSB

Quote Quick Reply

post #10 of 15 (permalink) 06-21-2011, 08:45 AM

Blackcloud556
Go Green!

Join Date: Jun 2010
Location: Coeur D'Alene Idaho
Posts: 5,938

yep. and keep in mind that these may or may not be the final HP numbers for this engine. we are still working on getting deeper into the ECM and as time progresses tunes and peak HP numbers may change

Quote Quick Reply

Reply

1 2 >

Gear in this thread - Powered by O'Reilly Auto Parts

Schumacher Electric - Metal Hand-Held Linear Battery Charger/Starter

Metal Hand-Held Linear Battery Charger/Starter - 50 Amp Engine Starter; 10/2 Amp; Fully Automatic; 2 LED Indicator Lights; Rugged Durable Metal Case; Top Mounted Carrying Handle

>> More on Schumacher Electric - Metal Hand-Held Linear Battery Charger/Starter

Power Service Products Diesel 9-1-1 - Diesel Fuel Winter Additive

Diesel Fuel Winter Additive - Winter Rescue Formula; De-Ices Frozen Fuel Filters; Reliquifies Gelled Fuel; Prevents Fuel Filter Icing; Treats 30 to 75 Gallons; 32 Oz.

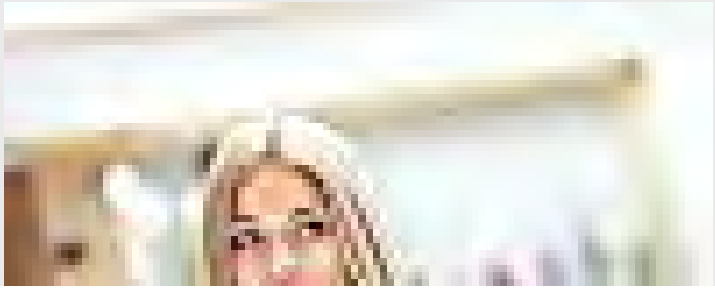
>> More on Power Service Products Diesel 9-1-1 - Diesel Fuel Winter Additive

Bosch - Scan Tool

Scan Tool - OBD 1000 Pocket Scan(R) OBD II Code Reader

>> More on Bosch - Scan Tool

You May Like



Quick Reply

Message:

Options

Quote message in reply?

Human Verification

In order to verify that you are a human and not a spam bot, please enter the answer into the following box below based on the instructions contained in the graphic.

Quick Reply

POST QUICK REPLY | GO ADVANCED

« Anyone use the power puck? Looking for a simple plug in device. | Husky Weatherbeater floor liners »

Posting Rules

You **may** post new threads
You **may** post replies
You **may not** post attachments
You **may not** edit your posts

BB code is **On**
Smilies are **On**
[IMG] code is **On**
HTML code is **Off**
Trackbacks are **On**
Pingbacks are **On**
Refbacks are **On**

Forum Rules

post #11 of 15 (permalink) 07-21-2011, 08:11 PM

Deisel Dog
Junior Member

Join Date: Nov 2010
Posts: 57

Quote:
Originally Posted by **DENALI HD3500**

> *Waste of time useing a tuner without doing full deletes anyway. Your mileage will drop if anything useing a tuner. Bully Dog is really not a good tuner for the DMAX anyway.*

Really ? Got a buddy with an 05 completely stock with BD GT and his millage went up from 18 to 23 mpg.

---

05 GMC Sierra Duramax LLY Crew cab short bed
4" MBRP DP back
Hypertech / AFE Turbo Mouth Peice
Bilstein 5100's

post #12 of 15 (permalink) 08-01-2011, 02:38 AM

Alain
Duramax Lifetime Supporter
LIFETIME PREMIUM MEMBER

Join Date: Oct 2009
Location: Fort Mcmurray
Posts: 81

Those HP numbers are nice but how about EGT's with the stock exhaust? If EGT's are decent i would consider.

2011 GMC 3500 Denali Dually, AMP boards, Reese 20K hitch, H&S mini maxx, Flow pro 5" turbo back.

2012 M8
2011 Fuzion 305
2011 RZR xp 900
2010 Harley muscle
2009 Pitster

Quote Quick Reply

post #13 of 15 (permalink) 08-03-2011, 10:26 AM

NCR Motorsports
Banned

Join Date: Jun 2011
Location: 61701
Posts: 67

Thanks for posting the stuff on Bully Dog and the performance numbers. I am also one who does NOT want to remove their emissions equiptment, so contrary to what Denali has said its NOT a waste. All my other diesels also pick up fuel mileage with a tuner on a stock truck. Not sure where he gets some of his info but becareful posting it if its not warranted or proven. :booboo

Quote Quick Reply

post #14 of 15 (permalink) 08-03-2011, 03:48 PM

DENALI HD3500
DuramaxForum Veteran

Join Date: Feb 2011
Posts: 1,294

Quote:

Originally Posted by **Deisel Dog**

> *Really ? Got a buddy with an 05 completely stock with BD GT and his millage went up from 18 to 23 mpg.*

The LLY in an 05 does not have DPF and regen ther is no comparason in emmisions between the pre 07.5 Duramax and post 07.5 Duramax fuel system and emission equipment, my 05 did gain a small amount with an edge and all stock. However the LMM and LML have DPF and regen, and on my LMM the tuner did not improve economy overall, this was due to slightly more regen from added fuel(especially when hot rodded). To gain maximum MPG the regen process HAS to be deleted as well.

2015 SLT CCSB Summit White on Jet Black sunroof/rear slider/driver alert/ cooled/heated leather/nav/ telescope/tilt steer... Z71 package .

Previous:2002 LB7 ECSB
2005 LLY CCSB
2007.5 LMM CCSB
2010 CTD CCSB
2011 LML CCSB

Quote Quick Reply

post #15 of 15 (permalink) 08-03-2011, 03:52 PM

DENALI HD3500
DuramaxForum Veteran

Join Date: Feb 2011
Posts: 1,294

Quote:
Originally Posted by **NCR Motorsports**

> *Thanks for posting the stuff on Bully Dog and the performance numbers. I am also one who does NOT want to remove their emissions equiptment, so contrary to what Denali has said its NOT a waste. All my other diesels also pick up fuel mileage with a tuner on a stock truck. Not sure where he gets some of his info but becareful posting it if its not warranted or proven. :booboo*

I get my info from first hand trial and error. Not only with my diesel trucks but with the feedback from my customers that have had me perform tuner and deletes and the ones that just ask for tuner and no emmision alterations. The ones getting the best mileage on the 07.5 and up GM diesel are fully deleted and tuned.The pre DPF truck all gain even with Cat system. No hard feelings, i'm here to help and learn and respect any reasonable comments toward me.

2015 SLT CCSB Summit White on Jet Black sunroof/rear slider/driver alert/ cooled/heated leather/nav/ telescope/tilt steer... Z71 package .

Previous:2002 LB7 ECSB
2005 LLY CCSB
2007.5 LMM CCSB
2010 CTD CCSB
2011 LML CCSB

Last edited by DENALI HD3500; 08-03-2011 at 03:54 PM.

Quote Quick Reply

Reply

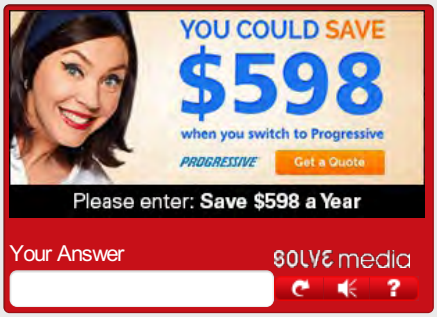
Quick Reply

Message:

Options

Quote message in reply?

Human Verification
In order to verify that you are a human and not a spam bot, please enter the answer into the following box below based on the instructions contained in the graphic.



POST QUICK REPLY GO ADVANCED

« Anyone use the power puck? Looking for a simple plug in device. | Husky Weatherbeater floor liners »

Posting Rules

You **may** post new threads
You **may** post replies
You **may not** post attachments
You **may not** edit your posts

BB code is **On**
Smilies are **On**
[IMG] code is **On**
HTML code is **Off**
Trackbacks are **On**
Pingbacks are **On**
Refbacks are **On**

Forum Rules